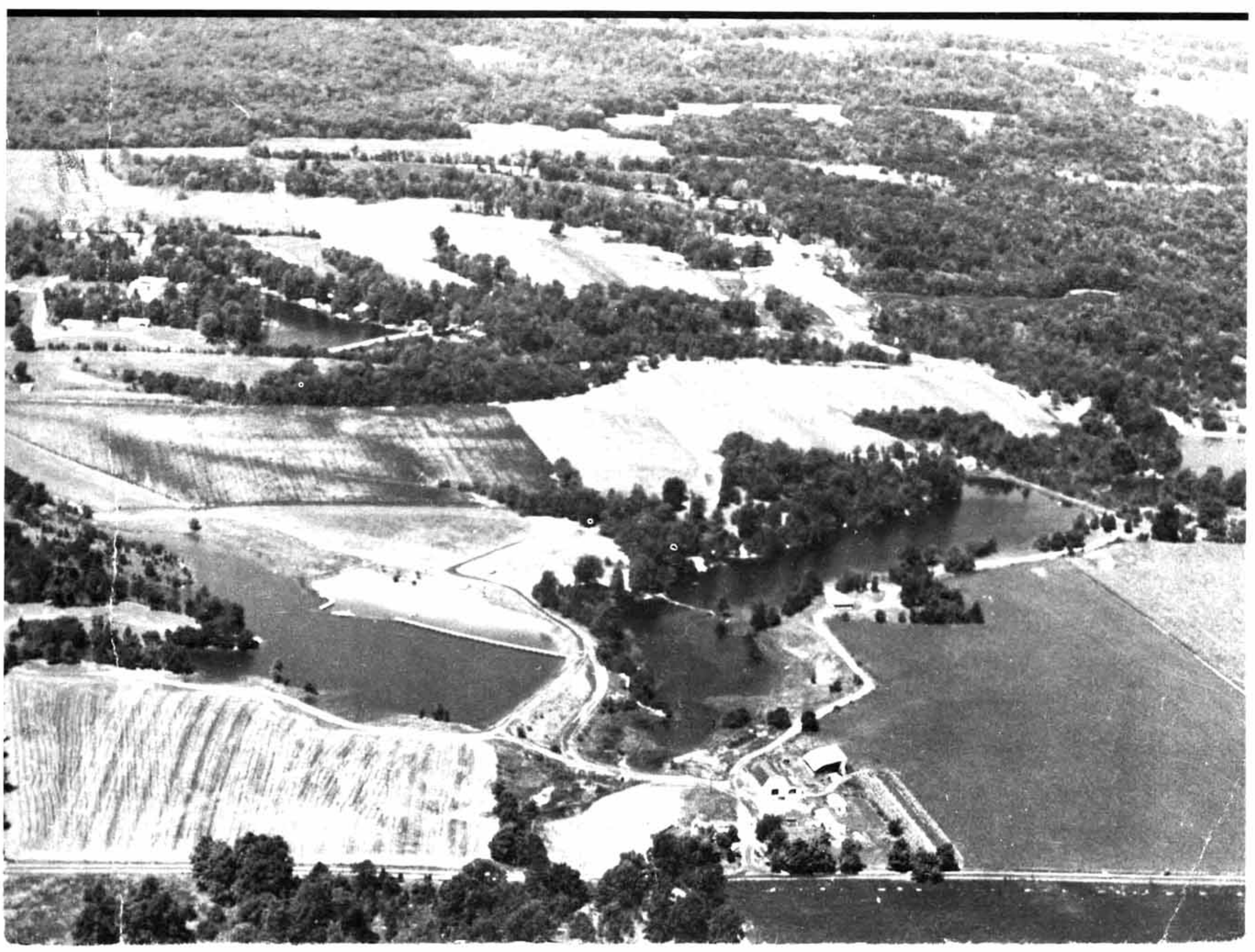
Soil Survey of

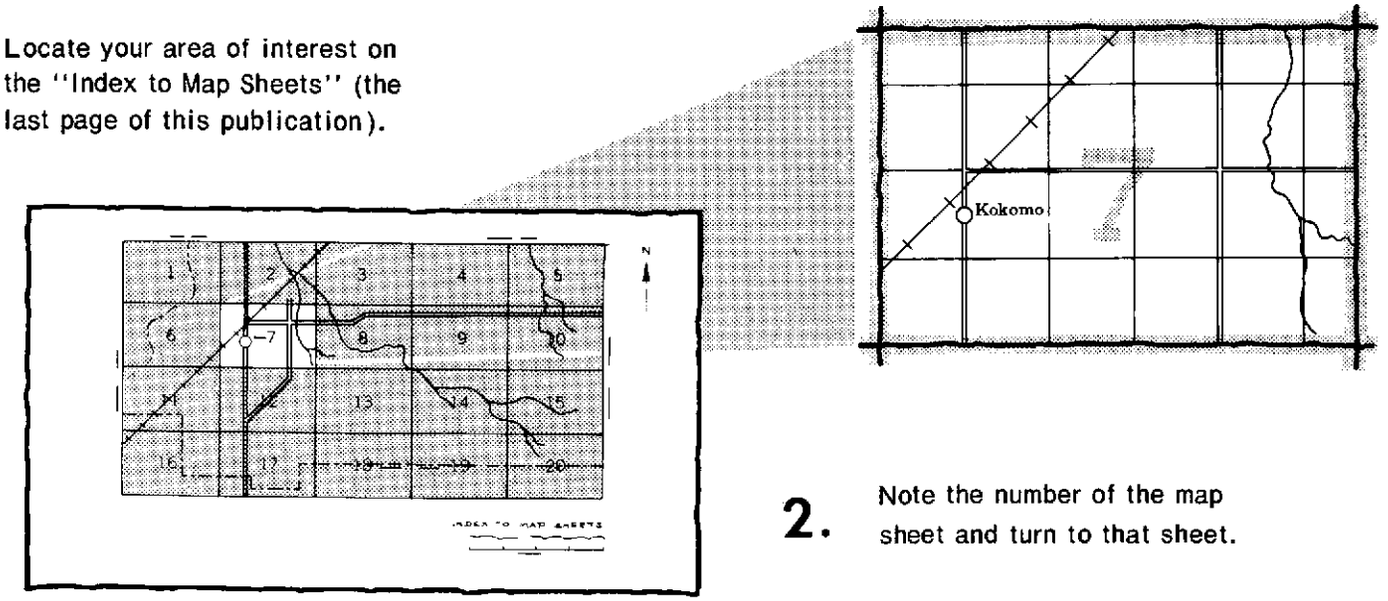
Morgan County Indiana

United States Department of Agriculture, Soil Conservation Service
in cooperation with Purdue University, Agricultural Experiment Station,
and Indiana Department of Natural Resources, Soil and Water Conservation Committee



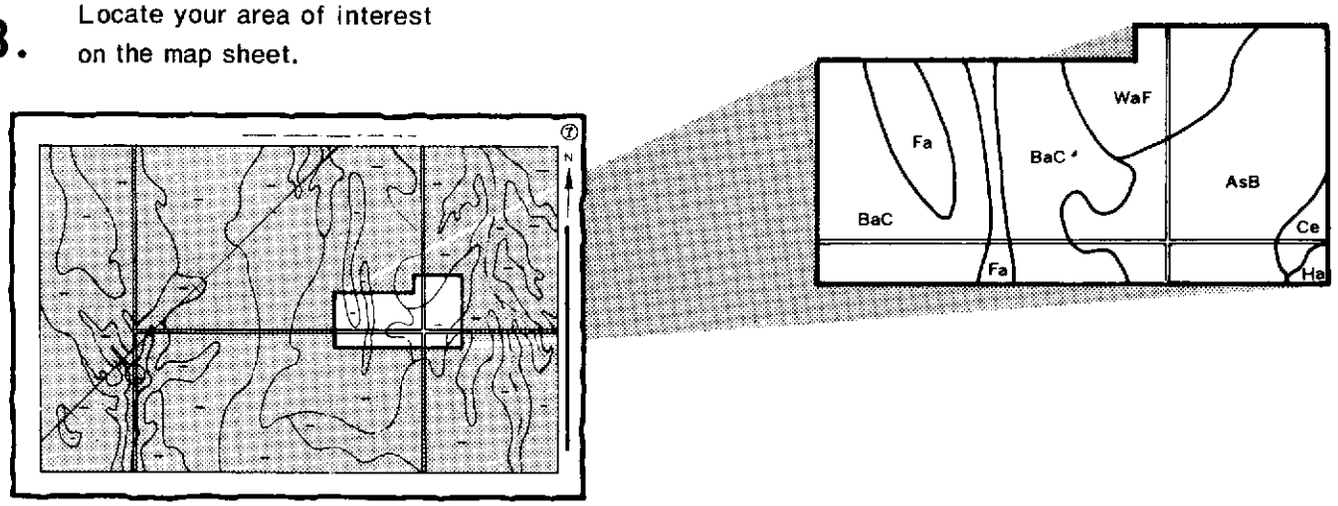
HOW TO USE

1. Locate your area of interest on the "Index to Map Sheets" (the last page of this publication).

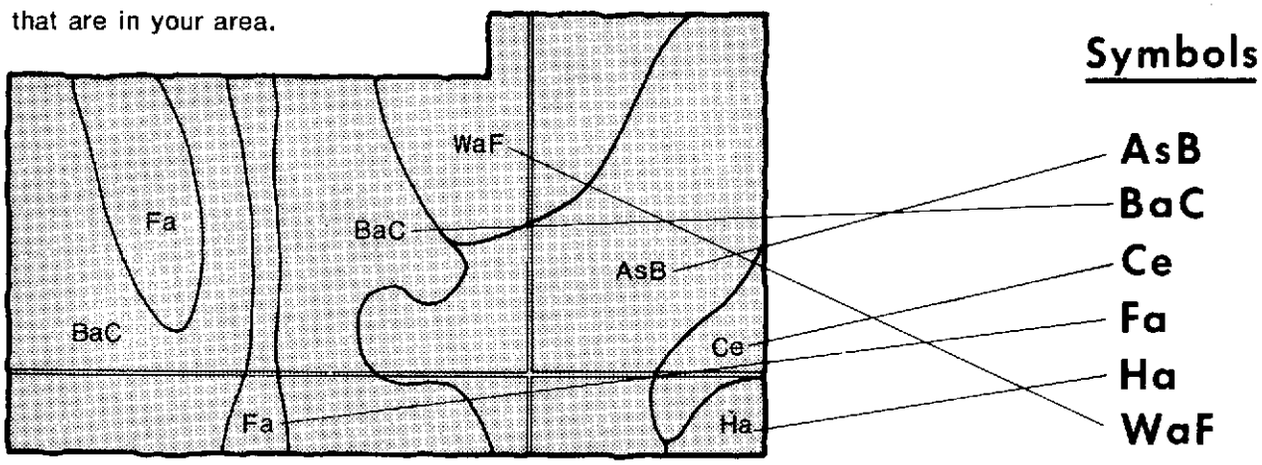


2. Note the number of the map sheet and turn to that sheet.

3. Locate your area of interest on the map sheet.

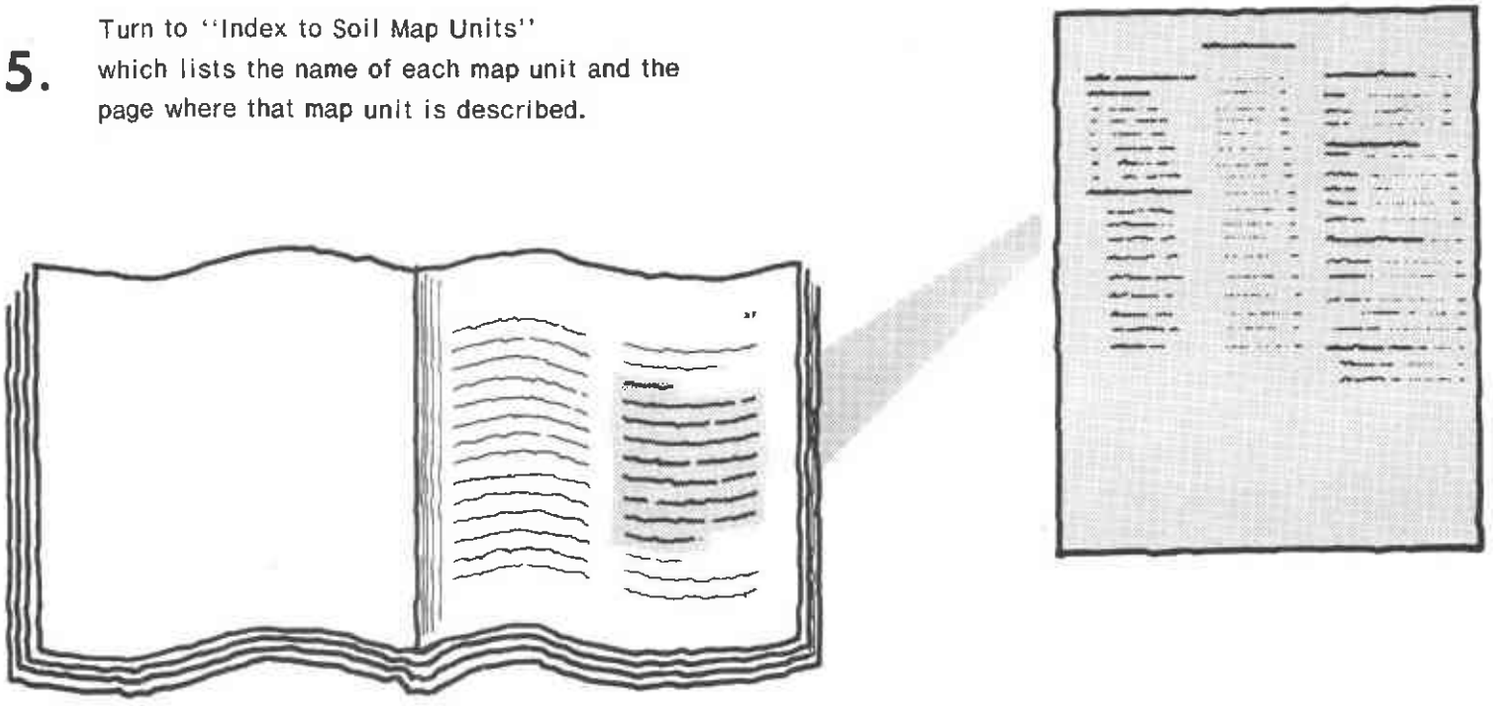


4. List the map unit symbols that are in your area.

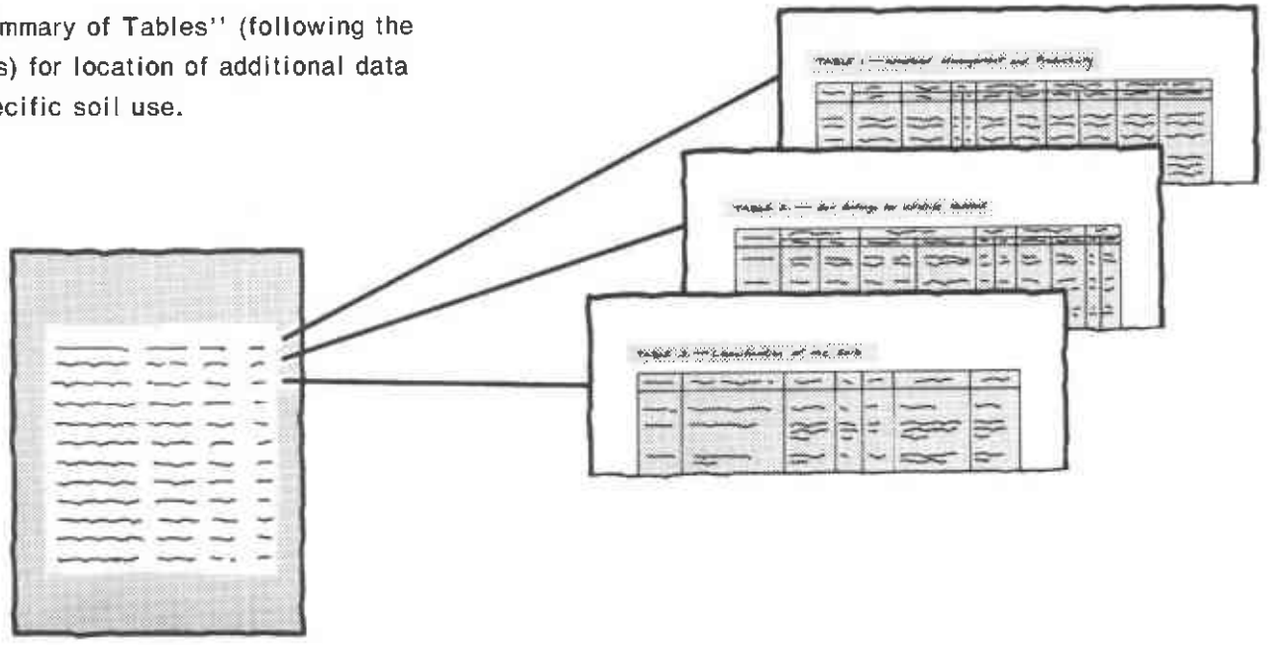


THIS SOIL SURVEY

5. Turn to "Index to Soil Map Units" which lists the name of each map unit and the page where that map unit is described.



6. See "Summary of Tables" (following the Contents) for location of additional data on a specific soil use.



7. Consult "Contents" for parts of the publication that will meet your specific needs. This survey contains useful information for farmers or ranchers, foresters or agronomists; for planners, community decision makers, engineers, developers, builders, or homebuyers; for conservationists, recreationists, teachers, or students; to specialists in wildlife management, waste disposal, or pollution control.

This soil survey is a publication of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other federal agencies, state agencies including the Agricultural Experiment Stations, and local agencies. The Soil Conservation Service has leadership for the federal part of the National Cooperative Soil Survey. In line with Department of Agriculture policies, benefits of this program are available to all, regardless of race, color, national origin, sex, religion, marital status, or age.

This survey was made cooperatively by the Soil Conservation Service; Purdue University, Agricultural Experiment Station; and the Indiana Department of Natural Resources, Soil and Water Conservation Committee. It is part of the technical assistance furnished to the Morgan County Soil and Water Conservation District. Financial assistance was made available by the Morgan County Commissioners and Council and the Indiana Department of Natural Resources. Major fieldwork was performed in the period 1974-78. Soil names and descriptions were approved in 1978. Unless otherwise indicated, statements in this publication refer to conditions in the survey area in 1978.

Soil maps in this survey may be copied without permission. Enlargement of these maps, however, could cause misunderstanding of the detail of mapping. If enlarged, maps do not show the small areas of contrasting soils that could have been shown at a larger scale.

This survey supersedes the survey of Morgan County, Indiana, that was published in 1950 (*3*).

Cover: Soils in the Miami-Crosby map unit are used mainly as cropland. The area around the lake is being developed for recreation uses.

contents

soil series

Issued November 1981

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summary of tables

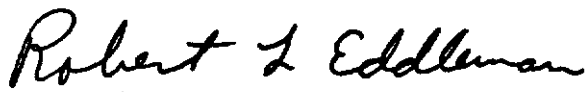
foreword

This soil survey contains information that can be used in land-planning programs in Morgan County, Indiana. It contains predictions of soil behavior for selected land uses. The survey also highlights limitations inherent in the soil or hazards that adversely affect the soil, improvements needed to overcome the limitations or reduce the hazards, and the impact of selected land uses on the environment.

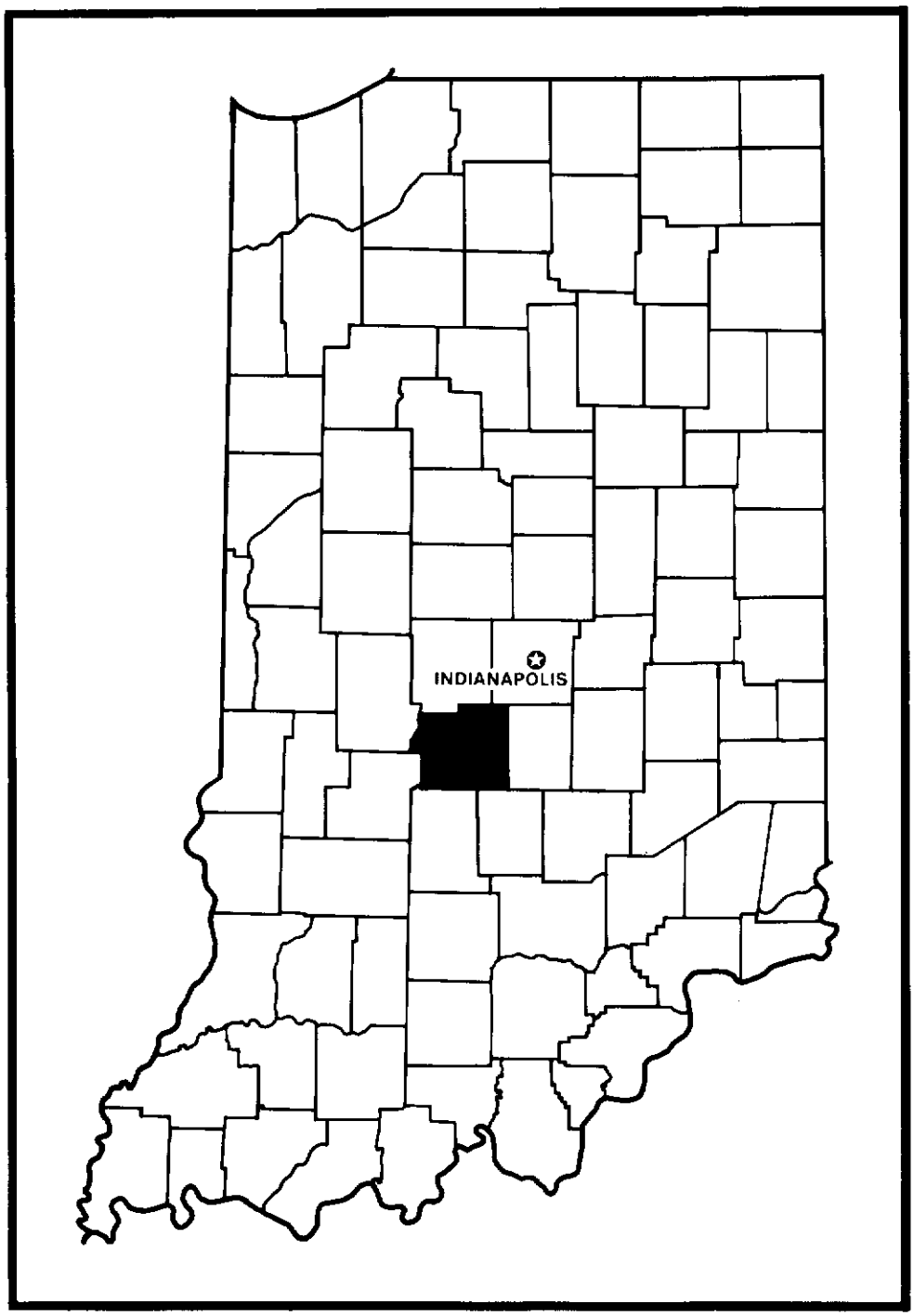
This soil survey is designed for many different users. Farmers, foresters, and agronomists can use it to evaluate the potential of the soil and the management needed for maximum food and fiber production. Planners, community officials, engineers, developers, builders, and home buyers can use the survey to plan land use, select sites for construction, and identify special practices needed to insure proper performance. Conservationists, teachers, students, and specialists in recreation, wildlife management, waste disposal, and pollution control can use the survey to help them understand, protect, and enhance the environment.

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are shallow to bedrock. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

These and many other soil properties that affect land use are described in this soil survey. Broad areas of soils are shown on the general soil map. The location of each soil is shown on the detailed soil maps. Each soil in the survey area is described. Information on specific uses is given for each soil. Help in using this publication and additional information are available at the local office of the Soil Conservation Service or the Cooperative Extension Service.



Robert L. Eddleman
State Conservationist
Soil Conservation Service



Location of Morgan County in Indiana.

soil survey of
Morgan County, Indiana

By Ralph H. Sturm, Soil Conservation Service

Fieldwork by Ralph H. Sturm, James R. Blank, and Charles E. Froehle,
Soil Conservation Service,
and Stephen K. Kluess and Terry L. Stephenson,
Indiana Department of Natural Resources, Soil and Water Conservation Committee

United States Department of Agriculture, Soil Conservation Service
in cooperation with Purdue University, Agricultural Experiment Station
and Indiana Department of Natural Resources,
Soil and Water Conservation Committee

MORGAN COUNTY is in the central part of Indiana. It covers an area of about 406 square miles, or 259,840 acres, and is about 20 miles long and 20 miles wide. Martinsville, the county seat and largest city, is located near the center of the southern half of the county.

Farming is the main enterprise in the county. Cash grain and livestock are the major types of farming, but there are also several orchards. Beef cattle and hogs are the livestock most commonly raised.

general nature of the survey area

relief

The highest point in Morgan County is on Long Ridge in Clay Township, about 970 feet above sea level. The lowest point is at the White River in the southwestern corner of the county, at about 550 feet above sea level.

The relief of Morgan County is complex. The northern part is nearly level and rolling and has few abrupt changes in the elevation. The central and southern parts vary more in elevation and have sharp drops of as much as 250 feet from the ridgetops to the bottom lands. Broad flat flood plains are along the White River, which flows from northeast to southwest. The glacial lakebed in the northwestern corner of the county is also broad and flat.

water supply

Ground water is the main source of water in Morgan County. In many areas ground water is scarce because of bedrock. In areas where the overlying unconsolidated material is very thin, most wells terminate in bedrock. These wells supply little or no water, and small manmade ponds or rural water systems are necessary. In areas where wells terminate in glacial till, water yields are usually low to moderate.

The largest and most reliable source of ground water is the valley of the White River and its major tributaries. Large amounts of water can usually be pumped from wells that extend into the thick, coarse textured alluvial deposits in this valley.

climate

Prepared by the National Climatic Center, Asheville, North Carolina.

Morgan County is cold in winter but quite hot in summer. Winter precipitation, frequently snow, results in a good accumulation of soil moisture by spring and minimizes drought during summer on most soils. Normal

annual precipitation is adequate for all crops that are adapted to the temperature and the length of the growing season in the area.

Table 1 gives data on temperature and precipitation for the survey area, as recorded at Greencastle, Indiana, for the period 1951 to 1974. Table 2 shows probable dates of the first freeze in fall and the last freeze in spring. Table 3 provides data on length of the growing season.

In winter the average temperature is 30 degrees F, and the average daily minimum temperature is 21 degrees. The lowest temperature on record, which occurred at Greencastle on February 2, 1951, is -20 degrees. In summer the average temperature is 74 degrees, and the average daily maximum temperature is 85 degrees. The highest recorded temperature, which occurred on July 15, 1954, is 107 degrees.

Growing degree days, shown in table 1, are equivalent to heat units. During the month, growing degree days accumulate by the amount that the average temperature each day exceeds a base temperature (40 degrees F). The normal monthly accumulation is used to schedule single or successive plantings of a crop between the last freeze in spring and the first freeze in fall.

Of the total annual precipitation, 24 inches, or 60 percent, usually falls in April through September, which includes the growing season for most crops. In 2 years out of 10, the rainfall in April through September is less than 21 inches. The heaviest 1-day rainfall during the period of record was 6.50 inches at Greencastle on June 22, 1952. Thunderstorms occur on about 45 days each year, and most occur in summer.

Average seasonal snowfall is 29 inches. The greatest snow depth at any one time during the period of record was 14 inches. On the average, 15 days have at least 1 inch of snow on the ground, but the number of such days varies greatly from year to year.

The average relative humidity in midafternoon is about 60 percent. Humidity is higher at night, and the average at dawn is about 80 percent. The percentage of possible sunshine is 70 in summer and 45 in winter. The prevailing wind is from the southwest. Average windspeed is highest, 12 miles per hour, in March.

Tornadoes and severe thunderstorms occur occasionally. These storms are usually local and of short duration and cause damage in a variable pattern.

transportation

Morgan County has approximately 700 miles of county, state, and federal highways. Two four-lane state highways cross the county from southwest to northeast, and a four-lane interstate highway crosses the northwest corner. All of these highways give quick and direct access to Indianapolis. In addition, several two-lane state highways cross the county, mostly in an east-west direction. Five road bridges span the White River on its 41-mile course through Morgan County.

There are several private airstrips in the county. Indianapolis International Airport to the north and Bloomington Airport to the south are each about 35 miles from Martinsville via a four-lane highway.

Two railroad systems with a total of about 30 miles of track serve Morgan County.

population and land use

In 1970, the population of Morgan County was about 50,000 and the population density about 123 people per square mile. The population increased about 30 percent between 1960 and 1970. The projected population for the year 2000 is about 75,000, an increase of 50 percent from 1970. The increased population is expected to come from people moving out of the Indianapolis and Bloomington metropolitan areas into the hills and scenic areas of Morgan County.

Because of this migration from the cities, some of the land once used for agriculture is being converted to urban uses. Much of the land around the cities of Martinsville and Mooresville and along state roads 37, 39, 44, 67, and 144 is no longer used for farming. At present, about 40 percent of the land in Morgan County is cultivated, 40 percent is woodland, 10 percent is pasture, and 10 percent is urban land or is used for other purposes. Careful planning is essential to maintain the highest possible output of food and fiber and also provide the goods and services needed by the increasing population of the county.

how this survey was made

Soil scientists made this survey to learn what soils are in the survey area, where they are, and how they can be used. They observed the steepness, length, and shape of slopes; the size of streams and the general pattern of drainage; the kinds of native plants or crops; and the kinds of rock. They dug many holes to study soil profiles. A profile is the sequence of natural layers, or horizons, in a soil. It extends from the surface down into the parent material, which has been changed very little by leaching or by plant roots.

The soil scientists recorded the characteristics of the profiles they studied and compared those profiles with others in nearby counties and in more distant places. They classified and named the soils according to nationwide uniform procedures. They drew the boundaries of the soils on aerial photographs. These photographs show trees, buildings, fields, roads, and other details that help in drawing boundaries accurately. The soil maps at the back of this publication were prepared from aerial photographs.

The areas shown on a soil map are called map units. Most map units are made up of one kind of soil. Some are made up of two or more kinds. The map units in this survey area are described under "General soil map units" and "Detailed soil map units."

While a soil survey is in progress, samples of some soils are taken for laboratory measurements and for engineering tests. All soils are field tested to determine their characteristics. Interpretations of those characteristics may be modified during the survey. Data are assembled from other sources, such as test results, records, field experience, and state and local specialists. For example, data on crop yields under defined management are assembled from farm records and from field or plot experiments on the same kinds of soil.

But only part of a soil survey is done when the soils have been named, described, interpreted, and delineated on aerial photographs and when the laboratory data and other data have been assembled. The mass of detailed information then needs to be organized so that it can be used by farmers, woodland managers, engineers, planners, developers and builders, home buyers, and others.

general soil map units

The general soil map at the back of this publication shows broad areas that have a distinctive pattern of soils, relief, and drainage. Each map unit on the general soil map is a unique natural landscape. Typically, a map unit consists of one or more major soils and some minor soils. It is named for the major soils. The soils making up one unit can occur in other units but in a different pattern.

The general soil map can be used to compare the suitability of large areas for general land uses. Areas of suitable soils can be identified on the map. Likewise, areas where the soils are not suitable can be identified.

Because of its small scale, the map is not suitable for planning the management of a farm or field or for selecting a site for a road or building or other structure. The soils in any one map unit differ from place to place in slope, depth, drainage, and other characteristics that affect management.

The soils in the survey area vary widely in their potential for major land uses. Table 4 shows the extent of the map units shown on the general soil map. It lists the potential of each, in relation to that of the other map units, for major land uses and shows soil properties that limit use. Soil potential ratings are based on the practices commonly used in the survey area to overcome soil limitations. These ratings reflect the ease of overcoming the limitations. They also reflect the problems that will persist even if such practices are used.

Each map unit is rated for *cultivated crops, specialty crops, woodland, urban uses,* and *recreation areas.* Cultivated crops are those grown extensively in the survey area. Specialty crops are the vegetables and fruits that generally require intensive management. Woodland refers to areas of native or introduced trees. Urban uses include residential, commercial, and industrial developments. Intensive recreation areas are campsites, picnic areas, ballfields, and other areas that are subject to heavy foot traffic. Extensive recreation areas are those used for nature study and as wilderness.

Descriptions, names, and delineations of the soils in this survey do not fully agree with the surveys of adjacent counties published at an earlier date. These differences are the result of better knowledge of the soils, modified series concepts, and more detailed mapping. In some places small acreages of similar soils whose use and management are much the same were combined rather than mapped separately.

soil descriptions

areas dominated by deep, nearly level, well drained to somewhat poorly drained soils on flood plains and low terraces

This group of soils makes up about 20 percent of the county. The soils are used mainly for corn and soybeans. In a few areas they are used for wheat, hay, or pasture or as woodland. These soils have good potential for cultivated farm crops. They have poor potential for residential and urban development. In most areas the soils are subject to flooding.

1. Wakeland-Banlic-Wilbur

Deep, nearly level, somewhat poorly drained and moderately well drained soils that formed in silty alluvium; on bottom lands and low terraces

These soils are on river and stream bottom lands and low terraces adjacent to the uplands.

This map unit makes up about 6 percent of the county. About 45 percent of the unit is Wakeland soils, 20 percent is Banlic soils, and 10 percent is Wilbur soils. The rest is soils of minor extent.

The Wakeland soils are somewhat poorly drained. They are on moderately broad bottom lands. Their surface layer is brown silt loam, and the substratum is multicolored silt loam.

The Banlic soils are somewhat poorly drained. They are on low-lying terraces. Their surface layer is grayish brown silt loam, and the subsoil is pale brown, light yellowish brown, and light brownish gray mottled silt loam.

The Wilbur soils are moderately well drained. They are on slight rises on bottom lands. Their surface layer is dark grayish brown silt loam. The substratum is brown silt loam in the upper part and yellowish brown mottled silt loam in the lower part.

The minor soils in this map unit are the well drained Haymond soils on slight rises, the poorly drained Bonnie soils in depressions on bottom lands, and the somewhat poorly drained Bartle soils on higher terraces.

The soils in this unit are used mainly for cultivated crops. In most areas they have been drained. In some areas, especially in narrow drainageways or where creek beds meander, the soils are used as woodland.

These soils are suited to cultivated crops if they are drained. Wetness and the hazard of flooding are the main limitations. These soils are also well suited to trees.

These soils are generally not suited to use as building sites and septic tank absorption fields because of wetness and the hazard of flooding.

2. Genesee-Shoals

Deep, nearly level, well drained and somewhat poorly drained soils that formed in loamy and silty alluvium; on bottom lands

These soils are on river and stream bottom lands characterized by extensive, nearly level flats, drainageways, and oxbows.

This map unit makes up about 14 percent of the county. About 60 percent of the unit is Genesee soils, 20 percent is Shoals soils, and 20 percent is soils of minor extent.

The Genesee soils are well drained. They are on broad flats near the rivers and streams. Their surface layer is brown silt loam. The substratum is dark yellowish brown and yellowish brown silt loam and loam that has strata of sand and sandy loam in the lower part.

The Shoals soils are somewhat poorly drained. They are in narrow to moderately broad drainageways and oxbows. Their surface layer is dark grayish brown silt loam. The substratum is multicolored silt loam and loam.

The minor soils in this unit are very poorly drained Sloan soils in deep drainageways and oxbows, well drained Ross and Armiesburg soils in slightly higher areas, and well drained Stonelick soils on natural levees near the streams and the river.

The soils in this unit are used mainly for cultivated crops. They are suited to this use. Flooding and wetness are the main limitation.

These soils are well suited to trees.

These soils are generally not suited to use as building sites and septic tank absorption fields because of flooding and wetness.

areas dominated by deep, nearly level and gently sloping, very poorly drained to well drained soils on outwash plains, terraces, lakebeds, and uplands

This group of soils makes up about 16 percent of the county. In most areas the soils are used for corn, soybeans, and wheat. In a few areas they are used for hay or pasture or as woodland. These soils have good potential for cultivated farm crops. They have poor potential for residential and urban development. Most of these soils have a seasonal high water table.

3. Rensselaer-Whitaker-Martinsville

Deep, nearly level and gently sloping, very poorly drained, somewhat poorly drained, and well drained soils that formed in loamy and silty sediment; on terraces, lakebeds, and outwash plains

These soils are on outwash plains, lakebeds, and terraces characterized by broad, nearly level flats, slight rises, and islandlike humps.

This map unit makes up about 9 percent of the county. About 30 percent of the unit is Rensselaer soils, 30 percent is Whitaker soils, and 25 percent is Martinsville soils. The rest is soils of minor extent.

The Rensselaer soils are nearly level and very poorly drained. They are in broad depressions and drainageways. Their surface layer is very dark gray clay loam. The subsoil is dark gray, grayish brown, and gray mottled clay loam.

The Whitaker soils are nearly level and somewhat poorly drained. They are on slightly higher rises and islandlike humps. Their surface layer is dark grayish brown loam. The subsoil is light yellowish brown, brown, and pale brown mottled loam and clay loam.

The Martinsville soils are nearly level and gently sloping and are well drained. They are on slightly higher rises and islandlike humps. Their surface layer is brown. The subsoil is yellowish brown loam, clay loam, and sandy loam.

The minor soils in this unit are very poorly drained Milford and poorly drained Patton soils in the lowest depressions and drainageways and somewhat poorly drained Crosby and well drained Miami soils on slightly higher rises.

The soils in this unit are used mainly for cultivated crops. In most areas the soil has been artificially drained.

These soils are suited to cultivated crops. Wetness is the main limitation. If cultivated, Rensselaer and Whitaker soils need to be drained. Ponding is a problem on Rensselaer soils.

These soils are suited to trees. On the Rensselaer soils harvesting may need to be delayed until the ground is dry or frozen.

Martinsville soils are well suited to use as septic tank absorption fields and building sites. Whitaker and Rensselaer soils are poorly suited to these uses because of wetness. Ponding is an additional limitation on the Rensselaer soils.

4. Patton-Whitaker

Deep, nearly level, poorly drained and somewhat poorly drained soils that formed in silty and loamy sediment; on glacial lakebeds and outwash plains

These soils are on lakebeds and outwash plains characterized by very flat, nearly level topography.

This map unit makes up about 1 percent of the county. About 50 percent is Patton soils, 25 percent is Whitaker soils, and 25 percent is soils of minor extent.

The Patton soils are poorly drained. They are on broad flats and in depressions. Their surface layer is very dark grayish brown and dark brown silty clay loam. The subsoil is gray and grayish brown mottled silty clay loam.

The Whitaker soils are somewhat poorly drained. They are on low, small, islandlike rises. Their surface layer is

dark grayish brown loam. The subsoil is light yellowish brown, brown, and pale brown mottled loam and clay loam.

The minor soils in this unit are very poorly drained Milford and Rensselaer soils in depressions and drainageways, poorly drained Evansville soils on flats, and somewhat poorly drained Reesville and Crosby soils on slightly higher rises.

The soils in this unit are used mainly for cultivated crops. In most areas the soil has been artificially drained.

These soils are suited to cultivated crops if drained. Wetness is the main limitation. Ponding is a problem on Patton soils.

These soils are suited to trees. On the Patton soils harvesting may need to be delayed until the ground is dry or frozen.

These soils are poorly suited to use as septic tank absorption fields and building sites because of wetness. Ponding is an additional limitation on the Patton soils.

5. Crosby-Brookston

Deep, nearly level and gently sloping, somewhat poorly drained and very poorly drained soils that formed in loess and the underlying glacial till or in glacial till; on uplands

These soils are on nearly level and gently sloping glacial till plains characterized by swales and swells.

The Crosby soils are nearly level or gently sloping and are somewhat poorly drained. They are on higher flats and slight rises. Their surface layer is grayish brown silt loam. The subsoil is pale brown and yellowish brown mottled silty clay loam and clay loam.

The Brookston soils are nearly level and are very poorly drained. They are in depressions, swales, and poorly defined drainageways. Their surface layer is very dark gray clay loam. The subsoil is gray and yellowish brown mottled clay loam.

The minor soils in this unit are well drained Miami soils on knobs and breaks that extend into drainageways, very poorly drained Rensselaer soils in broader drainageways, and somewhat poorly drained Whitaker soils on slight rises near the Rensselaer soils.

The soils in this unit are used mainly for cultivated crops. In most areas the soil has been artificially drained.

These soils are suited to cultivated crops if they are drained. Wetness is the main limitation. Ponding is a problem on Brookston soils.

These soils are suited to trees. On Brookston soils harvesting may need to be delayed until the ground is dry or frozen.

These soils are poorly suited to use as septic tank absorption fields and building sites because of wetness. Ponding is an additional limitation on Brookston soils.

areas dominated by deep, nearly level to very steep, well drained to somewhat poorly drained soils on uplands

This group of soils makes up about 25 percent of the county. In most areas the soils are used for corn, soybeans, and wheat. In some fairly large areas they are used for hay or pasture or as woodland. The nearly level to moderately sloping soils have good potential for cultivated crops. The gently sloping and moderately sloping soils have fair potential for residential and urban development. In most areas these soils are subject to erosion or have a seasonal high water table.

6. Miami-Crosby

Deep, nearly level to very steep, well drained and somewhat poorly drained soils that formed in loess and the underlying glacial till; on uplands

These soils are on rolling glacial till plains characterized by small flats, knolls, and well defined drainageways.

This map unit makes up about 13 percent of the county. About 50 percent of the unit is Miami soils, 20 percent is Crosby soils, and 30 percent is soils of minor extent.

The Miami soils are gently sloping to very steep and are well drained. They are on knolls and breaks that extend into drainageways. Their surface layer is brown silt loam. The subsoil is strong brown and yellowish brown silty clay loam and clay loam.

The Crosby soils are nearly level and gently sloping and are somewhat poorly drained. They are on flats and slight rises. Their surface layer is grayish brown silt loam. The subsoil is pale brown and yellowish brown mottled silty clay loam and clay loam.

The minor soils in this unit are very poorly drained Brookston and Rensselaer soils in depressions and shallow drainageways and well drained Genesee and somewhat poorly drained Shoals soils in well defined drainageways.

The soils in this unit are used mainly for cultivated crops. In some of the more sloping areas the Miami soils are used for pasture or as woodland.

These soils are generally suited to cultivated crops. The steeper Miami soils are not suited to crops. The main limitations are erosion on the Miami soils and wetness on the Crosby soils.

These soils are suited to trees. Harvesting may be difficult on the steeper Miami soils because of slope. Erosion during and after logging operations is also a problem on the steeper Miami soils.

These soils are poorly suited to use as septic tank absorption fields because of wetness and moderately slow permeability. Slope is an additional limitation on the steeper Miami soils.

7. Miami-Fincastle-Xenia

Deep, nearly level to very steep, well drained to somewhat poorly drained soils that formed in loess and the underlying glacial till; on uplands

These soils are on moderately dissected glacial till plains characterized by narrow, nearly level ridgetops, gently sloping, fairly broad shoulder slopes, and moderately sloping to very steep breaks that extend into drainageways.

This map unit makes up about 12 percent of the county. About 40 percent of the unit is Miami soils, 25 percent is Fincastle soils, and 15 percent is Xenia soils. The rest is soils of minor extent.

The Miami soils are gently sloping to very steep and are well drained. They are on breaks that extend into drainageways. Their surface layer is brown silt loam. The subsoil is strong brown and yellowish brown silty clay loam and clay loam.

The Fincastle soils are nearly level and are somewhat poorly drained. They are on ridgetops. Their surface layer is grayish brown silt loam. The subsoil is yellowish brown and brown mottled silt loam, silty clay loam, and clay loam.

The Xenia soils are gently sloping and are moderately well drained. They are on fairly broad shoulder slopes. Their surface layer is brown silt loam. The upper part of the subsoil is yellowish brown silty clay loam, and the lower part is yellowish brown mottled clay loam and loam.

The minor soils in this unit are well drained Genesee and somewhat poorly drained Shoals soils in drainageways and well drained Berks soils on very steep toe slopes downslope from the Miami soils.

In about half of the areas the soils are used for cultivated crops. In the other half they are used for pasture or as woodland.

These soils are generally suited to cultivated crops. However, the steeper Miami soils are not suited to crops. Erosion is the main limitation. Wetness is an additional problem on the Fincastle soils.

These soils are suited to trees. Harvesting may be difficult on the steeper Miami soils because of slope. Erosion during and after logging operations is also a problem on the steeper Miami soils.

Miami and Xenia soils are suited to use as building sites. Fincastle soils are poorly suited to use as building sites because of wetness. All of the soils are poorly suited to use as septic tank absorption fields because of permeability or wetness.

areas dominated by deep and moderately deep over sand and gravel, nearly level to moderately steep, well drained soils on outwash plains, terraces, and uplands

This group of soils makes up about 5 percent of the county. In most areas the soils are used for corn, soybeans, wheat, hay, or pasture. The steeper soils are used as woodland. The nearly level to moderately sloping soils have fair potential for cultivated crops and good potential for urban and residential development. In most areas erosion or droughtiness is a hazard.

8. Fox-Ockley

Nearly level to strongly sloping, well drained soils that are moderately deep and deep over sand and gravel and that formed in loamy outwash; on terraces and outwash plains

These soils are on terraces and outwash plains characterized by broad, nearly level areas and sloping breaks that extend into drainageways and onto the bottom lands of the White River.

This map unit makes up about 2 percent of the county. About 45 percent of the unit is Fox soils, 30 percent is Ockley soils, and 25 percent is soils of minor extent.

The Fox soils are nearly level to moderately sloping and are moderately deep over sand and gravelly sand. They are on the sides of drainageways and on broad terraces near the White River bottom lands. Their surface layer is brown loam. The subsoil is brown, reddish brown, and dark brown loam, clay loam, and gravelly loam.

The Ockley soils are nearly level and gently sloping and are deep. They are on high, broad terraces and outwash plains. Their surface layer is dark brown. The subsoil is brown, strong brown, and reddish brown clay loam, gravelly clay loam, and sandy clay loam.

The minor soils in this unit are well drained Martinsville soils on high terraces near the uplands and very poorly drained Rensselaer, somewhat poorly drained Whitaker, and somewhat poorly drained Shoals soils in depressions and drainageways.

The soils in this unit are used mainly for cultivated crops. In some areas they are used for pasture.

These soils are suited to cultivated crops. Droughtiness is a problem during extended dry seasons, especially on the Fox soils. These soils are suited to trees.

These soils are suited to use as building sites. Fox soils are poorly suited to use as septic tank absorption fields because of the danger of underground water supplies becoming polluted. Ockley soils are well suited to this use.

9. Princeton

Deep, nearly level to moderately steep, well drained soils that formed in windblown silt and sand on uplands

These soils are on upland silt and sand deposits characterized by rolling topography and long slopes extending into the higher uplands.

This map unit makes up about 3 percent of the county. About 75 percent of the unit is Princeton soils, and 25 percent is soils of minor extent.

The surface layer of the Princeton soils is brown fine sandy loam. The subsoil is yellowish brown, yellowish red, strong brown, and yellowish brown sandy clay loam and loamy fine sand.

The minor soils in this unit are somewhat excessively drained Bloomfield soils on more rolling, less stable areas; Martinsville soils on slightly lower, nearly level terraces; well drained Hickory and Chetwynd soils on steep breaks; and well drained Alford soils on slightly higher ridges.

The soils in this unit are used mainly for cultivated crops and pasture. In a few areas they are used as woodland.

In the less sloping areas these soils are suited to cultivated crops. Erosion is a problem on the more sloping soils. Droughtiness is a hazard during dry seasons.

These soils are suited to trees.

In the less sloping areas, these soils are suited to use as building sites and septic tank absorption fields.

areas dominated by deep, nearly level to very steep, well drained soils on uplands, outwash plains, terraces, and moraines

This group of soils makes up about 8 percent of the county. In most areas the soils are used for corn, soybeans, and wheat. In some fairly large areas they are used for hay or pasture or as woodland. The nearly level to moderately sloping soils have good potential for cultivated crops and fair potential for urban and residential development. In most areas erosion is a hazard.

10. Alford-Grayford

Deep, nearly level to strongly sloping, well drained soils that formed in loess or in loess, loamy glacial till, and limestone residuum; on uplands

The soils are in gently rolling areas, on breaks that extend into drainageways, and in bowl-shaped depressions and sinkholes.

This map unit makes up about 2 percent of the county. About 50 percent of the unit is Alford soils, 30 percent is Grayford soils, and 20 percent is soils of minor extent.

The Alford soils are nearly level to moderately sloping. They are on narrow broad areas between sinkholes. Their surface layer is brown silt loam. The subsoil is yellowish brown and strong brown silt loam and silty clay loam.

The Grayford soils are moderately sloping and strongly sloping. They are on side slopes adjacent to sinkholes. Their surface layer is dark yellowish brown silt loam. The subsoil is yellowish brown, reddish brown, and red silty clay loam, silt loam, and clay.

The minor soils in this unit are well drained Parke and Pike soils on low knolls, well drained Cincinnati and Hickory soils on breaks that extend onto slightly lower till plains, and somewhat poorly drained Wakeland and moderately well drained Wilbur soils in the bottom of sinkholes.

The soils in this unit are used mainly for cultivated crops, hay, or pasture. The more sloping soils are used as woodland. The larger and deeper sinkholes are marshy or wooded.

In the less sloping areas these soils are suited to cultivated crops. Erosion is the main hazard.

These soils are suited to trees.

The less sloping soils are suited to use as building sites and septic tank absorption fields.

11. Alford-Hickory

Deep, nearly level to very steep, well drained soils that formed in loess or in loamy glacial till; on uplands

These soils are on uplands characterized by rolling ridgetops and steep breaks that extend into drainageways and narrow bottoms.

This map unit makes up about 1 percent of the county. About 40 percent of the unit is Alford soils, 35 percent is Hickory soils, and 25 percent is soils of minor extent.

The Alford soils are nearly level to moderately sloping. They are on rolling ridgetops. Their surface layer is brown silt loam. The subsoil is yellowish brown and strong brown silt loam and silty clay loam.

The Hickory soils are moderately steep to very steep. They are on breaks. Their surface layer is very dark grayish brown loam. The subsoil is yellowish brown and strong brown clay loam and loam.

The minor soils in this unit are well drained Princeton soils and somewhat excessively drained Bloomfield soils on ridgetops nearest the breaks into the White River valley, the somewhat poorly drained Iva soils in slight depressions on ridgetops, and somewhat poorly drained Wakeland soils in narrow drainageways and bottom lands.

The soils in this unit are used mainly for pasture and as woodland. In some areas, on the broader, less sloping ridgetops, they are used for cultivated crops.

The less sloping soils are suited to cultivated crops. Erosion is the main hazard.

These soils are suited to trees. Harvesting may be difficult on the steeper soils. Erosion during and after logging operations is also a problem on the steeper soils.

Alford soils are suited to use as building sites and septic tank absorption fields. Hickory soils are poorly suited to these uses because of slope.

12. Parke-Chetwynd-Pike

Deep, nearly level to very steep, well drained soils that formed in loess and the underlying loamy glacial drift or in outwash sediment; on moraines, outwash plains, and terraces

These soils are on moderately to highly dissected glacial till and outwash plains characterized by narrow to

fairly broad, nearly level ridgetops and steeply sloping breaks that extend into drainageways.

This map unit makes up about 5 percent of the county. About 35 percent of the unit is Parke soils, 30 percent is Chetwynd soils, and 15 percent is Pike soils. The rest is soils of minor extent.

The Parke soils are moderately sloping and strongly sloping. They are on narrow ridgetops and shoulder slopes. Their surface layer is brown silt loam. The subsoil is yellowish brown, strong brown, yellowish red, and red silty clay loam, clay loam, and sandy clay loam.

The Chetwynd soils are moderately steep to very steep. They are on breaks that extend into drainageways. Their surface layer is very dark grayish brown loam. The subsoil is strong brown and yellowish red loam, sandy clay loam, and sandy loam.

The Pike soils are nearly level and gently sloping. They are on broad ridgetops. Their surface layer is brown silt loam. The subsoil is strong brown, brown, and reddish brown silty clay loam, silt loam, loam, clay loam, and sandy clay loam.

The minor soils in this unit are well drained Markland soils on lower slopes adjacent to well drained Chetwynd soils, somewhat poorly drained Taggart soils on flats and in depressions and drainageways on broad ridgetops, and somewhat poorly drained Wakeland soils on narrow bottom lands.

The soils in this unit are used mainly for pasture and as woodland. In some areas, on the broader, less sloping ridgetops, they are used for cultivated crops.

The less sloping soils are suited to cultivated crops. Erosion is the main hazard.

These soils are suited to trees. Harvesting may be difficult on the steeper soils. Erosion during and after logging operations is also a problem on the steeper soils.

The less sloping Pike and Parke soils are suited to use as building sites and septic tank absorption fields. Chetwynd soils are poorly suited to these uses because of slope.

areas dominated by deep, nearly level to very steep, well drained to poorly drained soils on uplands

This group of soils makes up about 15 percent of the county. In most areas the soils are used for corn, soybeans, and wheat. In some large areas they are used for hay or pasture or as woodland. The nearly level to moderately sloping soils have fair potential for cultivated crops. Most of the soils have poor potential for residential and urban development. In some areas the soils are steep or have a fragipan.

13. Hickory-Bedford

Deep, gently sloping to very steep, well drained and moderately well drained soils that formed in glacial till or in loess and residuum from limestone; on uplands

These soils are on gently sloping and moderately sloping ridgetops and moderately steep to very steep sides of upland drainageways.

This map unit makes up less than 1 percent of the county. About 60 percent of the unit is Hickory soils, 15 percent is Bedford soils, and 25 percent is soils of minor extent.

The Hickory soils are moderately steep to very steep and are well drained. They are on sides of drainageways. Their surface layer is very dark grayish brown loam. The subsoil is yellowish brown and strong brown clay loam and loam.

The Bedford soils are gently sloping and moderately sloping. They are on ridgetops. Their surface layer is brown silt loam. The subsoil is yellowish brown, strong brown, yellowish red, and red silty loam, silty clay loam, silty clay, and clay.

The minor soils in this unit are well drained Alford, Berks, and Cincinnati soils and moderately well drained Ava soils on slightly lower, moderately broad ridgetops and breaks that extend into drainageways on the glacial till plains and the somewhat poorly drained Wakeland soils in narrow drainageways and bottom lands.

The soils in this unit are used mainly for pasture and as woodland. On some of the broader, less sloping ridgetops they are used for cultivated crops.

Bedford soils are suited to cultivated crops. Erosion is the main hazard. Hickory soils are generally not suited to this use because of slope.

These soils are suited to trees. Harvesting may be difficult on the Hickory soils because of slope. Erosion during and after logging operations is also a problem on Hickory soils.

These soils are poorly suited to use as building sites and septic tank absorption fields because of wetness and slope.

14. Hickory-Cincinnati-Ava

Deep, gently sloping to very steep, well drained and moderately well drained soils that formed in loamy glacial till or in loess and the underlying glacial till; on uplands

These soils are on moderately to highly dissected glacial till plains characterized by fairly narrow to narrow, gently sloping to strongly sloping ridgetops and moderately steep to very steep breaks that extend into drainageways.

This map unit makes up about 10 percent of the county. About 40 percent of the unit is Hickory soils, 25 percent is Cincinnati soils, and 20 percent is Ava soils. The rest is soils of minor extent.

The Hickory soils are moderately steep to very steep and are well drained. They are on middle and lower side slopes. Their surface layer is very dark grayish brown. The subsoil is yellowish brown and strong brown clay loam and loam.

The Cincinnati soils are moderately sloping and strongly sloping and are well drained. They are on

narrow to moderately broad ridgetops and upper side slopes. Their surface layer is brown silt loam. The subsoil is strong brown, brown, and yellowish brown silt loam, silty clay loam, and clay loam.

The Ava soils are gently sloping and are moderately well drained. They are in the flatter areas of the ridgetops. Their surface layer is dark brown silt loam. The subsoil is yellowish brown silt loam, silty clay loam, and clay loam.

The minor soils in this unit are well drained Berks soils on lower side slopes and toe slopes, somewhat poorly drained Wakeland soils in narrow drainageways and bottom lands, and poorly drained and somewhat poorly drained Vigo soils on nearly level ridgetops.

The soils in this unit are used mainly as woodland and pasture. In some areas, on the broader, less sloping ridgetops, they are used for cultivated crops.

The less sloping soils are suited to cultivated crops. Erosion is the main hazard. The fragipan in the Cincinnati and Ava soils restricts root growth.

These soils are suited to trees. Harvesting may be difficult on the Hickory soils because of slope. Erosion during and after logging operations is also a problem on the steeper soils.

The Ava and Cincinnati soils are suited to use as building sites. Wetness may be a problem on the Ava soils. Hickory soils are poorly suited to use as building sites because of slope. All of these soils are poorly suited to use as septic tank absorption fields because of wetness, slope, and permeability.

15. Vigo-Ava-Cincinnati

Deep, nearly level to strongly sloping, well drained to poorly drained soils that formed in loess and the underlying glacial till; on uplands

These soils are on uplands characterized by broad, nearly level flats and sloping breaks that extend into drainageways.

This map unit makes up about 4 percent of the county. About 50 percent of the unit is Vigo soils, 15 percent is Ava soils, and 15 percent is Cincinnati soils. The rest is soils of minor extent.

The Vigo soils are nearly level and are poorly drained and somewhat poorly drained. They are on broad flats. Their surface layer is gray silt loam. The subsoil is light gray and yellowish brown silty clay loam, clay loam, and loam.

The Ava soils are gently sloping and are moderately well drained. They are on slight rises and on side slopes of drainageways. Their surface layer is dark brown silt loam. The subsoil is yellowish brown silt loam, silty clay loam, and clay loam.

The Cincinnati soils are moderately sloping and strongly sloping and are well drained. They are on slight rises and on side slopes of drainageways. Their surface layer is brown silt loam. The subsoil is strong brown, yellowish brown, and brown silt loam, silty clay loam, and clay loam.

The minor soils in this unit are somewhat poorly drained Iva soils on slightly higher rises adjacent to Vigo soils, well drained Hickory soils on steep breaks that extend into drainageways, and somewhat poorly drained Wakeland soils in narrow drainageways and bottom lands.

These soils are used mainly for cultivated crops. Most areas have been drained. Some areas, especially those on the sloping breaks into drainageways, are used for pasture or as woodland (fig. 1).

These soils are suited to cultivated crops. Wetness on the Vigo soils and erosion on the Ava and Cincinnati soils are the main problems.

These soils are suited to trees. Wetness is a limitation on the Vigo soils. Harvesting may need to be delayed on these soils until the ground is dry or frozen.

Ava and Cincinnati soils are suited to use as building sites. Wetness is occasionally a problem on the Ava soils. Vigo soils are poorly suited to use as building sites because of wetness. All of these soils are poorly suited to use as septic tank absorption fields because of wetness and permeability.

areas dominated by moderately deep and deep, gently sloping to very steep, well drained soils on uplands

These soils make up about 11 percent of the county. In most areas the soils are used as woodland. These soils have poor potential for cultivated crops and poor potential for residential and urban development. The soils are moderately deep to bedrock, and erosion is a hazard.

16. Berks-Gilpin-Zanesville

Moderately deep and deep, gently sloping to very steep, well drained soils that formed in residuum of sandstone and shale or in loess and the underlying residuum of sandstone on uplands

These soils are in highly dissected areas of narrow to very narrow ridgetops, short shoulder slopes, and long steep slopes that extend into narrow drainageways and bottom lands.

This map unit makes up about 11 percent of the county. About 65 percent of the unit is Berks soils, 15 percent is Gilpin soils, and 10 percent is Zanesville soils. The rest is soils of minor extent.

The Berks soils are moderately deep. They are steep and are on side slopes, head slopes, and breaks that extend into drainageways and narrow bottom lands. Their surface layer is very dark grayish brown and brown channery silt loam. The subsoil is dark yellowish brown, yellowish brown, and strong brown channery loam and very channery loam.

The Gilpin soils are moderately deep. They are moderately sloping to moderately steep and are on very narrow ridgetops and on side slopes and shoulder

slopes of slightly broader ridgetops. Their surface layer is very dark brown and yellowish brown silt loam. The subsoil is yellowish brown and strong brown silt loam.

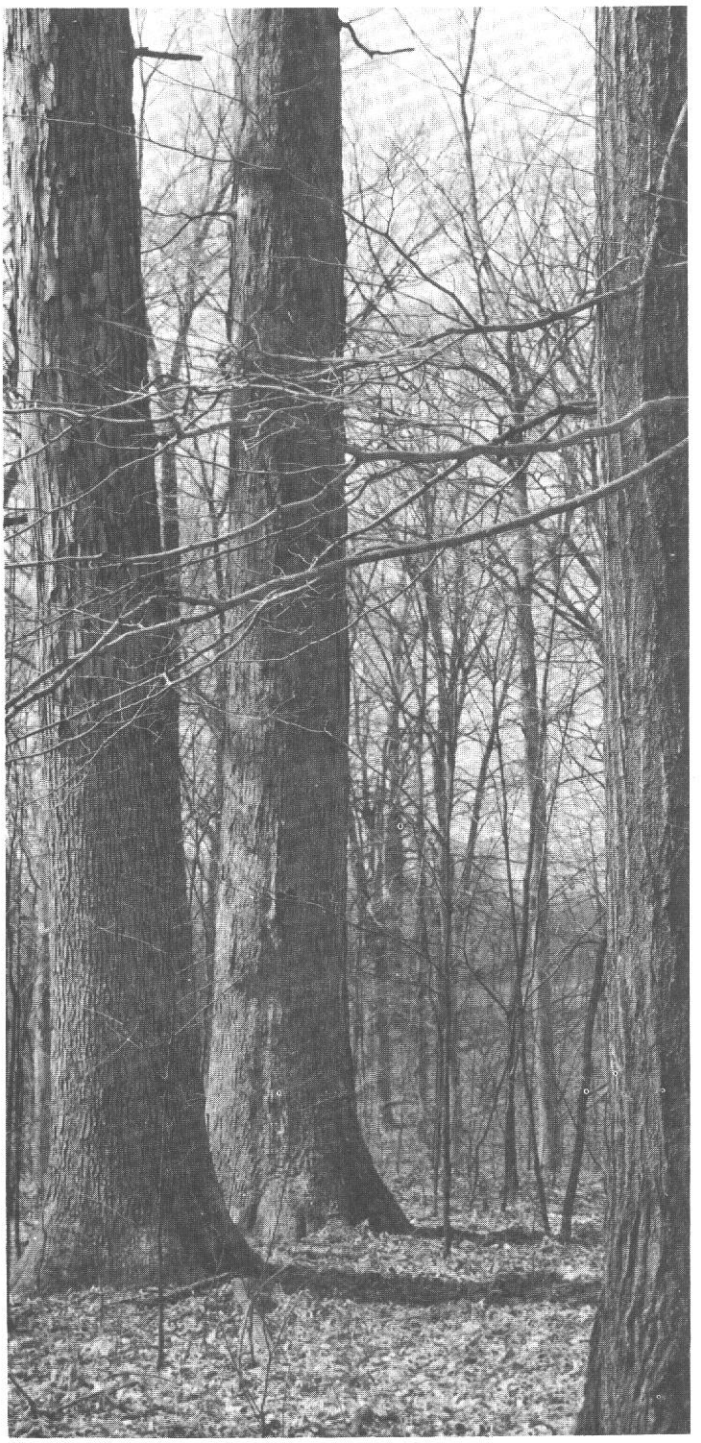


Figure 1.—The soils in the Vigo-Ava-Cincinnati map unit are suited to use as woodland.

The Zanesville soils are deep. They are gently sloping and moderately sloping and are on the broader ridgetops. Their surface layer is dark grayish brown and dark yellowish brown silt loam. The subsoil is brown and dark brown silt loam, silty clay loam, and clay loam.

The minor soils in this map unit are the well drained Wellston and Weikert soils and the somewhat poorly drained Wakeland soils. The Wellston soils are on narrow ridgetops and upper shoulder slopes between the Zanesville and Gilpin soils. The Weikert soils are on toe slopes. The Wakeland soils are in drainageways and on narrow bottom lands.

The soils in this unit are used mainly as woodland. In a few areas on ridgetops they are used for pasture.

These soils are generally not suited to cultivated crops. Some Zanesville soils on ridgetops are suited to use as cropland. Erosion is the main hazard.

These soils are suited to trees. Harvesting may be difficult on the steeper Gilpin and Berks soils. Erosion during and after logging operations is also a problem on the steeper soils.

The Zanesville soils and the less sloping Gilpin soils are suited to use as building sites. The Berks soils and the steeper Gilpin soils are generally not suited to this use. The soils in this unit are generally not suited to use as septic tank absorption fields because of slope, depth to bedrock, and slow permeability.

broad land use considerations

The major land use consideration facing the people of Morgan County is the gradual conversion of prime cropland to urban uses. The general soil map helps identify which areas of the county are best suited to urban development and which areas are best suited to use as cropland.

Morgan County has extensive areas where the soils are not suited to urban development. The soils in the Genesee-Shoals and the Wakeland-Banlic-Wilbur map units are on flood plains, and flooding is a severe hazard. The soils in these units are better suited to use as cropland than to urban use. The soils in the Crosby-Brookston, Rensselaer-Whitaker-Martinsville, and Patton-Whitaker map units are so wet that extensive drainage is needed if the soils are used for urban development. However, these soils are well suited to use as cropland.

Some of the soils are suited to more than one use. The Fox-Ockley soils have few limitations for urban development, but the Ockley soils, and to a lesser degree the Fox soils, are also well suited to use as cropland. Cropland and urban development are not the only potential uses for the soils of Morgan County. Areas need to be set aside for recreation, wildlife habitat, and woodland.

detailed soil map units

The map units on the detailed soil maps at the back of this survey represent the soils in the survey area. The map unit descriptions in this section, along with the soil maps, can be used to determine the suitability and potential of a soil for specific uses. They also can be used to plan the management needed for those uses. More information on each map unit, or soil, is given under "Use and management of the soils."

Each map unit on the detailed soil maps represents an area on the landscape and consists of one or more soils for which the unit is named.

A symbol identifying the soil precedes the map unit name in the soil descriptions. Each description includes general facts about the soil and gives the principal hazards and limitations to be considered in planning for specific uses.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer or of the underlying material, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer or of the underlying material. They also can differ in slope, stoniness, salinity, wetness, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Miami silt loam, 6 to 12 percent slopes, eroded, is one of several phases in the Miami series.

Some map units are made up of two or more major soils. These map units are called soil complexes.

A *soil complex* consists of two or more soils that occur as areas so intricately mixed or so small that they cannot be shown separately on the soil maps. The pattern and proportion of the soils are somewhat similar in all areas. Crosby-Miami silt loams, 2 to 4 percent slopes, eroded, is an example.

Most map units include small scattered areas of soils other than those for which the map unit is named. Some of these included soils have properties that differ substantially from those of the major soil or soils. Such differences could significantly affect use and management of the soils in the map unit. These dissimilar soils are described in each map unit. Also, some of the more unusual or strongly contrasting soils are identified by a special symbol on the soil maps.

This survey includes some *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Pits is an example. Some miscellaneous areas are large enough to be delineated on the soil maps. Some that are too small to be delineated are identified by a special symbol on the soil maps.

Table 5 gives the acreage and proportionate extent of each map unit. Other tables (see "Summary of tables") give properties of the soils and the limitations, capabilities, and potentials for many uses. The Glossary defines many of the terms used in describing the soils.

soil descriptions

AfA—Alford silt loam, 0 to 2 percent slopes. This is a nearly level, well drained soil on broad ridgetops or low knolls. The areas are irregular in shape and range from 5 to 40 acres in size.

Typically, the surface layer is brown silt loam about 8 inches thick. The subsoil is about 62 inches thick. In the upper part it is brown, friable silt loam; in the middle part it is strong brown, firm silty clay loam; and in the lower part it is yellowish brown, firm silty clay loam. In some places the surface layer is dark brown, and in other places the subsoil is more clayey.

Included with this soil in mapping are small areas of Iva soils in slight depressions or weakly defined drainageways. The included soils make up about 5 percent of the map unit.

Permeability is moderate, and the available water capacity is high. The content of organic matter is moderately low. Surface runoff is slow. The surface layer is friable and is easily worked within a fairly wide range of moisture content. It does, however, have a tendency to crust or puddle after hard rains.

In most areas this soil is used for cultivated crops, hay, or pasture. In a few small areas it is wooded. This soil is well suited to corn, soybeans, and wheat. Conservation tillage that leaves crop residue on the surface, crop rotation, cover crops, and green manure crops or other organic material added to the soil help improve soil tilth and reduce crusting.

This soil is well suited to grasses and legumes for hay or pasture. Overgrazing causes soil compaction and poor tilth and reduces plant density and hardiness. Proper stocking rates, pasture rotation, timely grazing, and weed control help keep the pasture and soil in good condition.

This soil is well suited to trees. The hazards and limitations are generally slight. Plant competition, however, is moderate. Competing vegetation can be controlled by spraying, cutting, or girdling.

This soil has moderate limitations for use as building sites because of the shrinking and swelling of the soils. Foundations, footings, and basement walls should be properly designed to help prevent structural damage caused by the shrinking and swelling. Foundation drain tile should be used to help remove excess water. This soil has slight limitations for use as septic tank absorption fields. It has severe limitations for local roads and streets because of frost action and low strength. Drainage ditches along roads and streets help prevent damage from frost action. The road base should be strengthened with suitable material.

This soil is in capability class I and in woodland suitability subclass 1o.

AfB—Alford silt loam, 2 to 6 percent slopes. This is a gently sloping, deep, well drained soil on uplands. It is on slight rises and side slopes of broad ridgetops. The areas are irregular in shape and range in size from 5 to 25 acres.

Typically, the surface layer is brown silt loam about 8 inches thick. The subsoil extends to a depth of 70 inches. It is yellowish brown, firm silt loam in the upper part, strong brown, firm silty clay loam in the middle part, and strong brown, firm and friable silt loam in the lower part. In some places the surface layer and subsoil are loam or clay loam.

Included with this soil in mapping are small areas of Cincinnati, Grayford, and Pike soils in slightly lower positions on the landscape. The included soils make up about 12 percent of the map unit.

Permeability is moderate, and the available water capacity is high. The content of organic matter is moderately low. Surface runoff is medium. The surface layer is friable and is easily worked within a fairly wide range of moisture content. It does, however, have a tendency to puddle and crust after hard rains.

In about half of the areas this soil is used for cultivated crops. The rest is used for hay or pasture or as woodland. This soil is well suited to corn, soybeans, and small grain. If the soil is cultivated, contour farming, tile outlet terraces, diversions, or grassed waterways are needed to control surface runoff and reduce sheet erosion. Conservation tillage that leaves crop residue on the surface, crop rotation, cover crops, and green manure crops or other organic material added to the soil help improve and maintain the content of organic matter and soil tilth. They also reduce crusting and erosion.

This soil is well suited to grasses and legumes for hay or pasture. Grasses and legumes effectively control erosion. Overgrazing causes compaction and poor tilth and reduces plant density and hardiness. Proper stocking rates, pasture rotation, timely grazing, and weed control help keep the pasture and soil in good condition.

This soil is well suited to trees. The hazards and limitations are generally slight. Plant competition, however, is moderate. Competing vegetation can be controlled by spraying, cutting, or girdling.

This soil has moderate limitations for use as building sites because of the shrink-swell potential. Foundations, footings, and basement walls should be properly designed to help prevent structural damage caused by the shrinking and swelling of the soil. Foundation drain tile should be used to help remove excess water. This soil has slight limitations for septic tank absorption fields. This soil has severe limitations for local roads and streets because of frost action and low strength. Drainage ditches along roads help prevent damage from frost action. The base for local roads and streets should be strengthened with suitable material.

This soil is in capability subclass IIe and in woodland suitability subclass 1o.

AfC2—Alford silt loam, 6 to 12 percent slopes, eroded. This is a moderately sloping, deep, well drained soil on uplands. It is on rises and side slopes of drainageways on narrow to broad ridgetops. The areas are irregular in shape and range in size from 5 to 15 acres.

Typically, the surface layer is dark yellowish brown silt loam about 7 inches thick. The subsoil to a depth of 70 inches is strong brown, firm silty clay loam. In some pedons the lower part of the surface layer and subsoil are loam or clay loam.

Included with this soil in mapping are small areas of Cincinnati and Hickory soils in slightly lower positions on the landscape. Also included are small areas of soils that are deeply gullied or severely eroded. The included soils make up about 6 percent of the map unit.

Permeability is moderate, and the available water capacity is high. The content of organic matter is moderately low. Surface runoff is medium. The surface layer is friable and is easily worked within a fairly wide range of moisture content. It does, however, have a tendency to puddle and crust after hard rains.

In most areas this soil is used for pasture or hay. In a few small areas it is used for cultivated crops or as woodland. This soil is suited to corn, soybeans, and small grain.

If the soil is cultivated, contour farming, tile outlet terraces, diversions, or grassed waterways are needed to control surface runoff and reduce sheet erosion. Conservation tillage that leaves crop residue on the surface, crop rotation, cover crops, and green manure crops or other organic material added to the soil help improve and maintain the content of organic matter and soil tilth and thus reduce crusting and erosion.

This soil is well suited to grasses and legumes for hay or pasture. Grasses and legumes effectively control erosion. Overgrazing causes compaction and poor tilth and reduces plant density and hardiness. Proper stocking rates, pasture rotation, timely grazing, and weed control help keep the pasture and soil in good condition.

This soil is well suited to trees. The hazards and limitations are generally slight. Plant competition, however, is moderate. Competing vegetation can be controlled by spraying, cutting, or girdling.

This soil has moderate limitations for use as building sites because of the shrink-swell potential and slope. Foundations, footings, and basement walls should be properly designed to help prevent structural damage caused by the shrinking or swelling of the soil. Foundation drain tile should be used to help remove excess water. This soil has moderate limitations for septic tank absorption fields because of slope. Shaping the land and installing the absorption field across the slope help to overcome this limitation. This soil has severe limitations for local roads and streets because of frost action and low strength. Drainage ditches along roads help prevent damage from frost action. The base for local roads and streets should be strengthened with suitable material.

This soil is in capability subclass IIIe and in woodland suitability subclass 1o.

Ar—Armiesburg silty clay loam. This is a nearly level, deep, well drained soil on broad bottom lands along large streams. This soil is frequently subject to flooding of brief duration. The areas are irregular in shape and range from 5 to 200 acres in size.

Typically, the surface layer is dark brown silty clay loam about 8 inches thick. The subsurface layer is very dark grayish brown silty clay loam about 7 inches thick. The subsoil is about 35 inches thick. In the upper part it is dark brown and brown, firm silty clay loam, and in the lower part it is dark yellowish brown, friable silty clay loam. The substratum to a depth of 60 inches is yellowish brown silty clay loam. In some places, the lower part of the subsoil is loam or sandy loam, or the dark-colored surface layer is thinner. In a few places the combined surface layer and subsoil are more than 50 inches thick.

Included with this soil in mapping are small areas of Shoals soils in slightly lower positions or in shallow drainageways. The included soils make up about 8 percent of the map unit.

Permeability is moderate, and the available water capacity is high. The content of organic matter is moderate. Surface runoff is slow. The surface layer is friable. However, it can be worked within only a rather narrow range of moisture content without resulting in compaction or puddling. The surface forms a crust after heavy rains or if worked when wet.

In most areas this soil is used for cultivated crops. In a few small areas it is used for hay or pasture or as woodland.

This soil is suited to corn and soybeans. It is not suited to small grain. If the soil is cultivated, flooding is the major hazard. The flooding is frequent but of brief duration. Johnsongrass is a problem in most areas along the White River. Conservation tillage that leaves crop residue on the surface, crop rotation, cover crops, and green manure crops or other organic matter added to the soil help improve fertility, increase water infiltration, and reduce compaction, puddling, and clodding.

This soil is suited to grasses and legumes for hay and pasture. Overgrazing or grazing when the soil is wet causes compaction and poor tilth and reduces plant density and hardiness. Proper stocking rates, pasture rotation, timely grazing, and weed control help keep the pasture and soil in good condition.

This soil is well suited to trees. The hazards and limitations are generally slight. Plant competition, however, is moderate. Competing vegetation can be controlled by spraying, cutting, or girdling.

This soil has severe limitations for use as building sites, septic tank absorption fields, and local roads and streets. It is generally not suited to these uses because of frequent flooding. Alternate sites should be selected.

This soil is in capability subclass IIIw and in woodland suitability subclass 1o.

AvB—Ava silt loam, 2 to 6 percent slopes. This is a gently sloping, deep, moderately well drained soil on narrow to moderately broad ridgetops, low knolls on broad level areas, and upper side slopes of drainageways. The areas are irregular in shape and range from 3 to 30 acres in size.

Typically, the surface layer is dark brown silt loam about 8 inches thick. The suburface layer is pale brown silt loam about 6 inches thick. The subsoil extends to a depth of 80 inches. In the upper part it is yellowish brown, mottled, firm silt loam; in the part below that it is light brownish gray and yellowish brown firm silt loam; in the part below that it is yellowish brown, firm and brittle, silty clay loam and silt loam (fragipan); and in the lowest part it is yellowish brown, firm clay loam. In some places the fragipan is not as strongly expressed, or the subsoil does not have a light brownish gray layer.

Included with this soil in mapping are small areas of Vigo or Iva soils on narrow flats. Also included are areas of Cincinnati or Hickory soils that have slopes of more than 6 percent. The included soils make up about 15 percent of the map unit.

Permeability is very slow, and the available water capacity is moderate. The water table is often at a depth of 2 to 4 feet in winter and early in spring.

The content of organic matter is moderately low. Surface runoff is medium. The surface layer is friable and is easily worked within a fairly wide range of moisture content. It does, however, have a tendency to crust or puddle after hard rains. Root development is restricted below a depth of 29 inches by the firm fragipan.

In most areas this soil is used as woodland or for pasture. In a few small areas it is used for cultivated crops.

This soil is suited to corn, soybeans, and wheat. Erosion is the major hazard. The fragipan restricts root

development and causes moisture stress during extended dry periods. Contour farming, tile outlet terraces, diversions, or grassed waterways are needed to control surface runoff and reduce sheet erosion. Conservation tillage that leaves crop residue on the surface, crop rotation, cover crops, and green manure crops or other organic material added to the soil help improve the content of organic matter and soil tilth and thus reduce crusting.

This soil is well suited to grasses and legumes for hay and pasture. Grasses and legumes effectively control erosion. The selection of grasses and legumes should be based on their tolerance to frost heave and restricted rooting depth. Overgrazing or grazing when the soil is wet causes compaction and poor tilth and reduces plant density and hardiness. Proper stocking rates, pasture rotation, timely grazing, and weed control help keep the pasture and soil in good condition.

This soil is well suited to trees. The hazards and limitations are generally slight. Plant competition, however, is moderate. Competing vegetation can be controlled by spraying, cutting, or girdling.

This soil has moderate limitations for dwellings without basements because of wetness and the shrink-swell potential. It has severe limitations for dwellings with basements because of wetness. Houses should be constructed without basements. An adequate drainage system helps reduce wetness. Foundations and footings should be properly designed to help prevent structural damage caused by the shrinking and swelling of the soil. Limitations are severe for septic tank absorption fields because of wetness and very slow permeability in the fragipan. The soil is generally not suited to this use. This soil has severe limitations for local roads and streets because of frost action and low strength. Drainage ditches along roads help reduce frost action. The road base should be strengthened with suitable material.

This soil is in capability subclass IIe and in woodland suitability subclass 2o.

Ba—Banlic silt loam. This is a nearly level, deep, somewhat poorly drained soil on very low terraces. This soil is rarely flooded. The areas are irregular in shape and range from 15 to 120 acres in size.

Typically, the surface layer is grayish brown, mottled silt loam about 7 inches thick. The subsurface layer is brown, mottled silt loam about 6 inches thick. The subsoil is about 49 inches thick. In the upper part it is pale brown, mottled, firm silt loam; in the part below that it is light yellowish brown, mottled, firm silt loam; in the part below that it is pale brown and light yellowish brown, mottled, firm and brittle or slightly brittle silt loam fragipan; and in the lowest part it is light brownish gray, mottled, firm silt loam. The substratum to a depth of about 70 inches is pale brown, mottled silt loam. In some places the subsoil is grayer and has more clay.

Included with this soil in mapping are small areas of better drained soils that have slopes of 2 to 5 percent and are on breaks along drainageways. Also included are small areas of poorly drained soils that are similar to Banlic soils and are in lower lying areas. The included soils make up about 10 percent of the map unit.

Permeability is slow, and the available water capacity is moderate. The content of organic matter is moderately low. Surface runoff is slow. The water table is often at a depth of 1 to 3 feet in winter and early in spring. The surface layer is friable and is easily worked within a fairly wide range of moisture content. It does, however, have a tendency to puddle and crust after hard rains.

In about half the areas this soil is used for cultivated crops. In the other areas it is used for hay or pasture or as woodland.

This soil is well suited to corn, soybeans, and wheat. Wetness is the major limitation. In most areas the soil has been drained. Additional subsurface drainage is needed in some areas. Land smoothing and shallow surface drains will also help remove excess surface water. Crop rotation, conservation tillage that leaves crop residue on the surface, cover crops, and green manure crops or other organic material added to the soil help improve fertility, reduce puddling and crusting, and increase water infiltration.

This soil is well suited to grasses and legumes for hay or pasture. Grasses and legumes should be selected on the basis of the extent of drainage. Overgrazing or grazing when the soil is wet causes compaction and poor tilth and reduces plant density and hardiness. Proper stocking rates, pasture rotation, timely grazing, and weed control help keep the pasture and soil in good condition.

This soil is well suited to trees. The hazard and limitations are generally slight. Plant competition, however, is moderate. Competing vegetation can be controlled by spraying, cutting, or girdling.

This soil has severe limitations for use as building sites because of wetness and rare flooding. It is generally not suited to this use. This soil has severe limitations for septic tank absorption fields because of slow permeability and wetness. It is generally not suited to this use. This soil has severe limitations for local roads and streets because of frost action. Drainage ditches along roads help reduce frost action.

This soil is in capability subclass IIw and in woodland suitability subclass 2o.

Bd—Bartle silt loam. This is a nearly level, deep, somewhat poorly drained soil on broad, moderately low lying terraces. The areas are irregular in shape and range from 5 to 35 acres in size.

Typically, the surface layer is brown, mottled silt loam about 7 inches thick. The subsurface layer is light yellowish brown, mottled silt loam about 5 inches thick. The subsoil is about 45 inches thick. In the upper part it is light yellowish brown, mottled, friable silt loam, and in the lower part it is a light yellowish brown and light brownish gray, mottled, very firm and brittle silt loam

fragipan. The substratum to a depth of about 60 inches is light gray mottled silt loam. In a few places the solum has more sand, and the substratum is stratified silt loam, loam, and sandy loam. In some pedons the fragipan is less strongly expressed.

Included with this soil in mapping are a few small areas of gently sloping Pekin soils. Also included are areas of Wilbur and Wakeland soils in narrow drainageways. The included soils make up about 5 percent of the map unit.

Permeability is very slow in the fragipan, and the available water capacity is moderate. The content of organic matter is moderately low. Surface runoff is slow. The water table is often at a depth of 1 to 2 feet in winter and early in spring. The surface layer is friable and is easily worked within a fairly wide range of moisture content. It does, however, have a tendency to puddle and crust after hard rains. The fragipan restricts root development below a depth of about 26 inches.

In most areas this soil is used for cultivated crops. In a few small areas it is used for hay or pasture or as woodland.

This soil is well suited to corn, soybeans, and wheat. Wetness is the major limitation. In most areas the soil has been drained. Additional subsurface drainage is needed in some areas. Land smoothing and shallow surface drains help remove excess surface water. Crop rotation, conservation tillage that leaves crop residue on the surface, cover crops, and green manure crops or other organic material added to the soil help improve fertility, reduce puddling and crusting, and increase water infiltration.

This soil is well suited to grasses and legumes for hay or pasture. Grasses and legumes should be selected on the basis of the extent of drainage. Overgrazing or grazing when the soil is wet causes compaction and poor tilth and reduces plant density and hardiness. Proper stocking rates, pasture rotation, timely grazing, and weed control help keep the pasture and soil in good condition.

This soil is suited to trees. The hazards and limitations are slight. Tree seeds, cuttings, and seedings survive and grow well if competing vegetation is controlled by site preparation or by spraying, cutting, or girdling. Species which are tolerant to wetness should be selected.

This soil has severe limitations for use as building sites because of wetness. An adequate drainage system helps reduce wetness. However, the areas are flat, and suitable outlets are difficult to obtain. Water moves slowly to drainage systems because of very slow permeability in the fragipan. This soil has severe limitations for septic tank absorption fields because of very slow permeability in the fragipan and wetness. It is generally not suited to this use. This soil has severe limitations for local roads and streets because of frost action. Drainage ditches along roads help remove excess water and reduce the frost action.

This soil is in capability subclass IIw and in woodland suitability subclass 3o.

BeB—Bedford silt loam, 2 to 6 percent slopes. This is a gently sloping, deep, moderately well drained soil on strongly dissected uplands. It is on narrow to moderately broad ridgetops. The areas are irregular or elongated in shape and range from 3 to 40 acres in size.

Typically, the surface layer is brown silt loam about 7 inches thick. The subsoil extends to a depth of 80 inches. In the upper part it is yellowish brown, firm silt loam; in the part below that it is strong brown, firm silty clay loam; in the part below that it is yellowish brown, mottled, firm silty clay loam; in the part below that it is yellowish brown, mottled, very firm, slightly brittle and brittle silty clay loam fragipan; and in the lowest part it is yellowish red, firm silty clay and red firm clay. In a few places limestone bedrock is at a depth of 48 to 60 inches. In other places the loess mantle is thicker than 54 inches, and the entire subsoil formed in loess. In some small places the surface layer is mixed with subsoil material and is yellowish brown.

Included with this soil in mapping are small areas of Alford soils in slighter higher positions on the landscape. The included soils make up about 10 percent of the map unit.

Permeability is moderate in the upper part of the subsoil and very slow in the fragipan. The available water capacity is moderate. The content of organic matter is moderately low. Surface runoff is medium. The water table is often at a depth of 2 to 4 feet in winter and early in spring. Natural fertility is low. The surface layer is friable and is easily worked within a fairly wide range of moisture content. It does, however, have a tendency to puddle and crust after hard rains, especially in areas where the surface layer is mixed with the subsoil. A fragipan restricts root development below a depth of about 27 inches.

In most areas this soil is used for pasture or hay. In a few small areas it is cultivated or wooded. This soil is suited to corn, soybeans, and small grain. Contour farming, tile outlet terraces, diversions, and grassed waterways are needed to control surface runoff and reduce erosion. Conservation tillage that leaves crop residue on the surface, cover crops, and green manure crops or other organic material added to this soil help improve the content of organic matter and tilth, reduce puddling and crusting, and thus reduce erosion.

This soil is well suited to grasses and legumes for hay or pasture. Grasses and legumes help control erosion. The selection of grasses and legumes should be based on their tolerance to frost heave and restricted rooting depth. Overgrazing or grazing when the soil is wet causes compaction and poor tilth and reduces plant density and hardiness. Proper stocking rates, pasture rotation, timely grazing, and weed control help keep the pasture and soil in good condition.

This soil is suited to trees. The hazards and limitations are slight.

This soil has moderate limitations for dwellings without basements because of wetness and the shrink-swell

potential. An adequate drainage system helps reduce wetness. This soil has severe limitations for dwellings with basements because of wetness. Houses should be constructed without basements. Foundations and footings should be properly designed to prevent damage caused by the shrinking and swelling of the soil. This soil has severe limitations for septic tank absorption fields because of very slow permeability and wetness. It is generally not suited to this use. This soil has severe limitations for local roads and streets because of frost action and low strength. Drainage ditches along roads help reduce frost action. The road base should be strengthened with suitable material.

This soil is in capability subclass IIe and in woodland suitability subclass 3o.

BeC2—Bedford silt loam, 6 to 12 percent slopes, eroded. This is a moderately sloping, deep, moderately well drained soil on strongly dissected uplands. It is on shoulder and back slopes of narrow to moderately broad ridgetops. The areas are irregular or elongated in shape and range from 5 to 50 acres in size.

Typically, the surface layer is brown silt loam about 5 inches thick. The subsoil extends to a depth of about 80 inches. In the upper part it is yellowish brown, firm silt loam; in the part below that it is yellowish brown, mottled, firm silty clay loam; in the part below that it is yellowish red, mottled, firm silty clay loam; and in the lowest part it is red, firm clay. In some places limestone bedrock is at a depth of 4 to 5 feet. In other places the loess mantle is less than 20 inches thick. In other places the surface layer is mixed with subsoil material and is yellowish brown.

Included with this soil in mapping are small areas of Cincinnati, Hickory, and Berks soils that are steeper. The included soils make up about 5 percent of the map unit.

Permeability is moderate in the upper part of the subsoil and very slow in the fragipan. The available water capacity is moderate. The content of organic matter is moderately low. Surface runoff is medium. The water table is often at a depth of 2 to 4 feet in winter and early in spring. The surface layer is friable and is easily worked within a fairly wide range of moisture content. It does, however, have a tendency to puddle and crust after hard rains, especially in areas where the surface layer is mixed with subsoil material. The fragipan restricts root development below a depth of about 26 inches.

In most areas this soil is used for pasture or hay. In a few small areas it is cultivated or wooded.

This soil is poorly suited to corn, soybeans, and wheat. If the soil is cultivated, contour farming, tile outlet terraces, diversions, or grassed waterways are generally needed to control surface runoff and erosion. Conservation tillage that leaves crop residue on the surface, cover crops, and green manure crops or other organic material added to the soil help improve and maintain the content of organic matter and soil tilth, reduce puddling and crusting, and thus reduce erosion.

This soil is suited to grasses and legumes for hay or pasture. Grasses and legumes effectively control erosion. The selection of grasses and legumes should be based on their tolerance to frost heave and restricted rooting depth. Overgrazing or grazing when the soil is wet causes compaction and poor tilth and reduces plant density and hardiness. Proper stocking rates, pasture rotation, timely grazing, and weed control help keep the pasture and soil in good condition.

This soil is suited to trees. The hazards and limitations are slight.

This soil has moderate limitations for dwellings without basements because of wetness, shrink-swell potential, and slope. It has severe limitations for dwellings with basements because of wetness. Buildings should be constructed without basements. An adequate drainage system helps reduce wetness. Slope can be modified by grading. Foundations and footings should be properly designed to prevent damage caused by the shrinking and swelling of the soil. This soil has severe limitations for septic tank absorption fields because of very slow permeability and wetness. It is generally not suited to this use. This soil has severe limitations for local roads and streets because of frost action and low strength. Drainage ditches help reduce frost action. The road base should be strengthened with suitable material.

This soil is in capability subclass IIIe and in woodland suitability subclass 3o.

BfG—Berks channery silt loam, 35 to 80 percent slopes. This is a very steep, moderately deep, well drained soil on side slopes and nose slopes of strongly dissected uplands. The areas are irregular in shape and range from 10 to 400 acres in size.

Typically, the surface layer is very dark grayish brown and brown channery silt loam about 6 inches thick. The subsoil is about 18 inches thick. In the upper part it is dark yellowish brown, friable channery loam; in the middle part it is yellowish brown, friable very channery loam; and in the lower part it is strong brown, friable very channery loam. The substratum to a depth of 30 inches is yellowish brown very channery loam. Sandstone bedrock is at a depth of 30 inches. In some places the subsoil has more clay. In other places the depth to bedrock is more than 40 inches.

Included with this soil in mapping are small areas of Gilpin soils and Weikert soils. Gilpin soils have fewer coarse fragments and are less steep. Weikert soils are shallow.

Also included are areas of Wakeland and Wilbur soils in elongated drainageways. The included soils make up about 20 percent of the map unit.

Permeability is moderate, and the available water capacity is very low. The content of organic matter is moderately low. Surface runoff is very rapid. The surface layer is friable. Root development is restricted below a depth of about 30 inches by bedrock.

In most areas this soil is wooded. In a few small areas it is used for pasture. This soil is generally not suited to

cultivated crops, hay, or pasture because of slope and the very low available water capacity.

This soil is suited to trees. However, the use of equipment is severely limited, seedling mortality is moderate, and erosion is a moderate hazard. Logging trails should be designed to minimize erosion. The steep slopes may limit the kind of logging equipment which can be used.

This soil has severe limitations for use as building sites, septic tank absorption fields, and local roads and streets because of steepness of slope and depth to bedrock. It is generally not suited to these uses. Alternate sites should be selected.

This soil is in capability subclass VIIe and in woodland suitability subclass 3f.

BmC—Bloomfield loamy fine sand, 6 to 12 percent slopes. This is a moderately sloping, deep, somewhat excessively drained soil on knolls and side slopes on uplands and terraces. The areas are irregular in shape and range from 3 to 20 acres in size.

Typically, the surface layer is dark grayish brown loamy fine sand about 5 inches thick. The subsurface layer is brown and yellowish brown loamy sand about 27 inches thick. The subsoil is about 29 inches thick. It is yellowish brown loamy sand that has thin strata of dark brown sandy loam. The substratum to a depth of about 70 inches is brownish yellow sand. In some places the subsoil has more silt and clay.

Included with this soil in mapping are small areas of somewhat poorly drained soils in drainageways or slight depressions. Also included are small areas of Princeton soils on upper side slopes and knoll tops. The included soils make up about 10 percent of the map unit.

Permeability is rapid, and the available water capacity is moderate. The content of organic matter is moderately low. Surface runoff is medium. The surface layer is friable and is easily worked within a wide range of moisture content.

In most areas this soil is used for hay or pasture or as woodland. In a few small areas it is cultivated.

This soil is poorly suited to corn, soybeans, and wheat. Droughtiness is the main hazard. In years when rainfall is below average or poorly distributed, crops are subject to severe damage from drought. Erosion may be a hazard in cultivated areas. Crop residue, winter cover crops, and green manure crops or other organic material added to the soil help improve fertility and the content of organic matter. Crop rotation, contour farming, conservation tillage, and grassed waterways help reduce soil loss.

This soil is suited to grasses and legumes for hay or pasture. Grasses and legumes effectively control erosion. Overgrazing causes compaction and poor tilth and reduces plant density and hardiness. Proper stocking rates, pasture rotation, timely grazing, and weed control help keep the pasture and soil in good condition.

This soil is suited to trees. The hazards and limitations are generally slight. Seedling mortality, however, is moderate. Seedlings are likely to be damaged in dry seasons because of the low available water capacity.

This soil has moderate limitations for use as building sites because of slope. Slope can be modified by grading. This soil has severe limitations for septic tank absorption fields because of rapid permeability. Effluent could contaminate water supplies. This soil has moderate limitations for local roads and streets because of slope. Slope can be modified by grading, or roads and streets can be designed to fit the slope.

This soil is in capability subclass IVs and in woodland suitability subclass 3s.

Bo—Bonnie silt loam. This is a nearly level, deep, poorly drained soil on flood plains. It is frequently flooded for long periods. The areas are irregular in shape and range from 5 to 100 acres in size.

Typically, the surface layer is grayish brown silt loam about 8 inches thick. The underlying material extends to a depth of about 60 inches. It is mottled silt loam in the upper part, grayish brown, mottled silt loam in the middle part, and gray, mottled silty clay loam in the lower part. In places the soil is neutral or mildly alkaline.

Included with this soil in mapping are a few small areas of Haymond and Wakeland soils in slightly higher positions on the landscape. The included soils make up about 5 percent of the map unit.

Permeability is moderately slow, and the available water capacity is high. The content of organic matter is moderately low. Surface runoff is very slow. The water table is often at or near the surface in winter and early in spring. The surface layer is friable and is easily worked within a fairly wide range of moisture content. It does, however, remain wet longer than the surrounding soils and is more likely to be flooded.

In about half the areas this soil is used for cultivated crops. In the other areas it is used for hay or pasture or as woodland.

This soil is suited to corn and soybeans but is poorly suited to wheat. Wetness is the major limitation. In some areas the soil has been drained. Additional surface drainage is generally needed. Land smoothing and shallow surface drains help remove excess surface water. Conservation tillage that leaves crop residue on the surface, crop rotation, cover crops, and green manure crops or other organic material added to the soil help improve fertility, reduce puddling and crusting, and increase water infiltration.

This soil is suited to grasses and legumes for hay or pasture. Grasses and legumes should be selected on the basis of the extent of drainage.

Overgrazing or grazing when the soil is wet causes compaction and poor tilth and reduces plant density and hardiness. Proper stocking rates, pasture rotation, timely grazing, and weed control help keep the pasture and soil in good condition.

This soil is suited to trees. However, the use of equipment is severely limited, seedling mortality is high,

windthrow is a severe hazard, and plant competition is severe. Harvesting may have to be delayed until the soil is dry or frozen. Species tolerant to wetness should be selected. Competing vegetation can be controlled by spraying, cutting, or girdling.

This soil has severe limitations for use as building sites, septic tank absorption fields, and local roads and streets because of wetness and frequent flooding. It is generally not suited to these uses. Low strength is an additional severe limitation for roads and streets, and slow permeability is an additional severe limitation for septic tank absorption fields. Alternate sites should be selected.

This soil is in capability subclass IIIw and in woodland suitability subclass 2w.

Br—Brookston clay loam. This is a nearly level, deep, very poorly drained soil in drainageways and broad depressions. It is ponded by runoff from adjacent soils. The areas are irregular in shape and range from 5 to 450 acres in size.

Typically, the surface layer is very dark gray clay loam about 7 inches thick. The subsurface layer is black clay loam about 10 inches thick. The subsoil is about 32 inches thick. In the upper part it is gray, mottled, firm clay loam, and in the lower part it is yellowish brown, mottled, firm clay loam. The substratum to a depth of about 60 inches is gray, mottled loam. In some places, silty clay loam horizons that formed in loess extend to a depth of 40 inches. In a few places the substratum and lower subsoil are sandy loam. In a few places lighter colored silt loam has been deposited on the original very dark gray surface layer.

Included with this soil in mapping are small areas of Crosby soils on slight rises. Areas of Rensselaer soils are also included. The included soils make up about 5 percent of the map unit.

Permeability is moderate, and the available water capacity is high. The content of organic matter is high. Surface runoff is very slow. The water table is near or above the surface in winter and early in spring. The surface layer is friable and is easily worked at the proper moisture content. However, if it is worked when wet, it is sticky and becomes cloddy and hard when it dries out.

In most areas this soil is used for cultivated crops. In a few small areas it is used for hay or pasture or as woodland.

This soil is well suited to corn, soybeans, and wheat. Wetness is the major limitation. In most areas the soil has been drained. Subsurface drainage is the dominant method of drainage. Shallow surface drains help remove excess surface water. Conservation tillage that leaves crop residue on the surface, crop rotation, cover crops, and green manure crops or other organic material added to the soil help improve fertility and tilth and increase water infiltration.

This soil is well suited to grasses and legumes for hay or pasture. Grasses and legumes should be selected on the basis of the extent of drainage.

Overgrazing or grazing when the soil is wet causes compaction and poor tilth and reduces plant density and hardiness. Proper stocking rates, pasture rotation, timely grazing, and weed control help keep the pasture and soil in good condition.

This soil is suited to trees. However, the use of equipment is severely limited, plant competition is severe, seedling mortality is high, and windthrow is a moderate hazard. Harvesting may have to be delayed until the soil is dry or frozen. Species tolerant to wetness should be selected. Competing vegetation can be controlled by spraying, cutting, or girdling.

This soil has severe limitations for use as building sites because of ponding. Drainage systems need to be installed to protect building sites from ponding. Buildings should be constructed without basements. This soil has severe limitations for septic tank absorption fields because of ponding and permeability. This soil has severe limitations for local roads and streets because of frost action, low strength, and ponding. Roadbeds should be elevated to reduce ponding. Drainage ditches help reduce wetness and frost action. The road base should be strengthened with suitable material.

This soil is in capability subclass IIw and in woodland suitability subclass 2w.

ChF—Chetwynd loam, 18 to 80 percent slopes. This is a moderately steep to very steep, deep, well drained soil on side slopes of strongly dissected outwash plains and terraces. The areas are irregular or elongated in shape and range from 10 to 200 acres in size.

Typically, the surface layer is very dark grayish brown loam about 4 inches thick. The subsurface layer is yellowish brown loam about 5 inches thick. The subsoil is about 48 inches thick. In the upper part it is strong brown firm loam, in the middle part it is yellowish red, firm sandy clay loam, and in the lower part it is strong brown, firm sandy loam. The substratum to a depth of 80 inches is reddish yellow sand in the upper part and brownish yellow sand in the lower part. It has lamellae or thin bands of sandy loam. In a few places the depth to sand is less than 45 inches.

Included with this soil in mapping are small areas of Parke and Pike soils on upper side slopes and narrow ridgetops. Also included are small areas of Berks and Weikert soils on very steep toe slopes and Wakeland soils in very narrow bottoms. The included soils make up about 15 percent of the map unit.

Permeability is moderate, and the available water capacity is high. The content of organic matter is moderately low. Surface runoff is rapid to very rapid. The surface layer is friable and is easily worked within a wide range of moisture content.

In most areas this soil is wooded. In a few small areas it is used for hay and pasture. This soil is generally not suited to crops.

This soil is well suited to trees. However, erosion is a severe hazard, and the use of equipment is severely

limited. Logging trails should be planned to minimize erosion. The steep slopes may limit the kind of logging equipment which can be used. Plant competition is a moderate limitation. Competing vegetation can be controlled by spraying, cutting, or girdling.

This soil has severe limitations for use as building sites, septic tank absorption fields, and local roads and streets because of steepness. It is generally not suited to these uses. Alternate sites should be selected.

This soil is in capability subclass VIIe and in woodland suitability subclass 1r.

CnC2—Cincinnati silt loam, 6 to 12 percent slopes, eroded. This is a moderately sloping, deep, well drained soil on narrow ridgetops and back and shoulder slopes on uplands. The areas are irregular in shape and range from 5 to 30 acres in size.

Typically, the surface layer is brown silt loam about 7 inches thick. The subsoil extends to a depth of 80 inches. In the upper part it is strong brown, firm silt loam; in the part below that it is yellowish brown, firm silty clay loam; in the part below that it is strong brown and yellowish brown, firm and brittle silty clay loam and clay loam fragipan; and in the lowest part it is strong brown, yellowish brown, and brown, firm clay loam.

Included with this soil in mapping are small areas of Ava and Vigo soils on narrow ridgetops and Hickory soils on foot slopes. Vigo and Hickory soils do not have a fragipan. The included soils make up about 15 percent of the map unit.

Permeability is moderate in the upper part of the subsoil and slow in the fragipan. The available water capacity is moderate. The content of organic matter is moderately low. Surface runoff is medium. The water table is below a depth of 4 feet. The surface layer is friable and is easily worked within a fairly wide range of moisture content. It does, however, have a tendency to puddle or crust after hard rains, especially in areas where the surface layer is mixed with subsoil material. Root development is restricted below a depth of about 23 inches by a fragipan.

In about half the areas this soil is used for cultivated crops. In the other areas it is used for pasture or hay or as woodland. This soil is suited to corn, wheat, and soybeans. Erosion is the major hazard. The fragipan restricts root development of some plants and causes moisture stress during extended dry periods. Contour farming, tile outlet terraces, diversions, or grassed waterways are needed to control surface runoff and reduce erosion. Conservation tillage that leaves crop residue on the surface, crop rotation, cover crops, green manure crops or other organic material added to the soil help improve and maintain the content of organic matter and soil tilth and thus reduce crusting and erosion.

This soil is well suited to grasses and legumes for hay or pasture. The selection of grasses and legumes should be based on their tolerance to frost heave and restricted rooting depth. Grasses and legumes effectively control erosion. Overgrazing or grazing when the soil is wet causes compaction and poor tilth and reduces plant density and hardiness. Proper stocking rates, pasture rotation, timely grazing, and weed control help keep the pasture and soil in good condition.

This soil is suited to trees. Seedling mortality is moderate, windthrow is a moderate hazard, and plant competition is moderate. Competing vegetation can be controlled by spraying, cutting, or girdling. Tree seeds, cuttings, and seedlings survive and grow well if competing vegetation is controlled by site preparation or by spraying, cutting, or girdling.

This soil has moderate limitations for dwellings without basements because of slope. It has moderate limitations for dwellings with basements because of wetness and slope. Drainage systems should be installed to overcome wetness. Slope can be modified by grading. This soil has severe limitations for septic tank absorption fields because of slow permeability in the fragipan. This soil has severe limitations for local roads and streets because of frost action and low strength. Drainage ditches along roads help prevent damage from frost action. The road base should be strengthened with suitable material.

This soil is in capability subclass IIIe and in woodland suitability subclass 2d.

CnC3—Cincinnati silt loam, 6 to 12 percent slopes, severely eroded. This is a moderately sloping, deep, well drained soil on shoulder and back slopes on uplands. The areas are irregular or elongated in shape and range from 3 to 15 acres in size.

Typically, the surface layer is dark yellowish brown silt loam about 6 inches thick. The subsoil is about 54 inches thick. In the upper part it is brown, firm silty clay loam; in the middle part it is strong brown, firm silty clay loam; and in the lower part it is strong brown, firm and brittle clay loam. The substratum to a depth of about 6 feet is yellowish brown clay loam. In some places the surface layer is gravelly. Narrow deep gullies are in some areas.

Included with this soil in mapping are small areas of Ava soils on shoulder slopes and Hickory soils on foot slopes. Hickory soils do not have a fragipan. The included soils make up about 5 percent of the map unit.

Permeability is moderate in the upper part of the subsoil and slow in the fragipan. The available water capacity is moderate. The content of organic matter is moderately low. Surface runoff is medium. The water table is below a depth of 4 feet. The surface layer is friable and is fairly easily worked within a fairly wide range of moisture content. It does, however, have a tendency to puddle or crust after hard rains. Root development is restricted below a depth of about 24 inches by a fragipan.

In most areas this soil is used for cultivated crops. In few areas it is used for hay or pasture, or it is idle. This soil is suited to corn, wheat, and soybeans. Erosion is

the major hazard. The fragipan restricts root development of some plants and causes moisture stress during extended dry periods.

Tile outlet terraces, diversions, contouring, and grassed waterways are needed in many areas to control surface runoff and erosion. Conservation tillage that leaves crop residue on the surface, crop rotation, cover crops, and green manure crops or other organic material added to the soil help improve the content of organic matter and tilth, reduce crusting, and increase infiltration. They also help reduce erosion.

This soil is well suited to grasses and legumes for hay or pasture. The selection of legumes and grasses depends on their tolerance to frost heave and restricted rooting depth. Grasses and legumes effectively control erosion.

Overgrazing or grazing when the soil is wet causes compaction and poor tilth and reduces plant density and hardiness. Proper stocking rates, pasture rotation, timely grazing, and weed control help keep the pasture and soil in good condition.

This soil is suited to trees. Seedling mortality is moderate, windthrow is a moderate hazard, and plant competition is moderate. Competing vegetation can be controlled by cutting, spraying, or girdling. Tree seeds, cuttings, and seedlings survive and grow well if competing vegetation is controlled by site preparation or by spraying, cutting, or girdling.

This soil has moderate limitations for dwellings without basements because of slope. It has moderate limitations for dwellings with basements because of wetness and slope. Drainage systems should be installed to reduce wetness. Slope can be modified by grading. This soil has severe limitations for septic tank absorption fields because of slow permeability in the fragipan. This soil has severe limitations for local roads and streets because of frost action and low strength. Drainage ditches along roads help prevent damage from frost action. The road base should be strengthened with suitable material.

This soil is in capability subclass IVe and in woodland suitability subclass 2d.

CnD2—Cincinnati silt loam, 12 to 18 percent slopes, eroded. This is a strongly sloping, deep, well drained soil on uplands. It is on short shoulder and back slopes and upper nose slopes. The areas are irregular in shape and range from 3 to 30 acres in size.

Typically, the surface layer is brown and dark yellowish brown silt loam about 7 inches thick. The subsoil is about 58 inches thick. In the upper part it is yellowish brown, firm silty clay loam; in the middle part it is yellowish brown, firm and brittle clay loam; and in the lower part it is brown, firm clay loam. The substratum to a depth of about 6 feet is dark yellowish brown, mottled loam. In some places the lower part of the subsoil and the substratum are silty clay loam that has free carbonates. In other places the surface layer is yellowish brown loam.

Included with this soil in mapping are small areas of Ava and Vigo soils on ridgetops and Hickory soils on foot slopes. Hickory and Vigo soils do not have a fragipan. The included soils make up about 15 percent of the map unit.

Permeability is moderate in the upper part of the subsoil and slow in the fragipan. The available water capacity is moderate. The content of organic matter is moderately low. Surface runoff is rapid. The water table is below a depth of 4 feet. The surface layer is friable and is easily worked within a fairly wide range of moisture content. It does, however, have a tendency to puddle or crust after hard rains, especially in areas where the surface layer is mixed with the subsoil. Root development is restricted below a depth of about 30 inches by the fragipan.

In about half the areas this soil is used for cultivated crops. In the other areas it is used for pasture or hay or as woodland. This soil is suited to corn, soybeans, and wheat. Erosion is the major hazard. The fragipan restricts root development of some plants and causes moisture stress during extended dry periods. Contour farming or grassed waterways help control surface runoff and erosion. Conservation tillage that leaves crop residue on the surface, crop rotation, cover crops, and green manure crops or other organic material added to the soil help improve the content of organic matter and soil tilth and thus reduce crusting and erosion.

This soil is well suited to grasses and legumes for hay or pasture. Grasses and legumes should be selected on the basis of tolerance to frost heave and restricted rooting depth. Grasses and legumes effectively control erosion.

Overgrazing or grazing when the soil is wet causes compaction and poor tilth and reduces plant density and hardiness. Proper stocking rates, pasture rotation, timely grazing, and weed control help keep the pasture and soil in good condition.

This soil is suited to trees. However, erosion is a moderate hazard, seedling mortality and plant competition are moderate, the use of equipment is moderately limited, and windthrow is a moderate hazard. Planning logging trails can help prevent erosion. Competing vegetation can be controlled by spraying, cutting, or girdling.

This soil has severe limitations for use as building sites because of slope. Disturbed areas should be revegetated as soon as possible after construction to prevent erosion. Slope can be modified by grading, or the building can be designed to fit the slope. This soil has severe limitations for septic tank absorption fields because of slope and slow permeability in the fragipan. It is generally not suited to this use.

This soil has severe limitations for local roads and streets because of frost action, low strength, and slope. Slope can be modified by cut and fill. Drainage ditches along roads help prevent damage from frost action. The road base should be strengthened with suitable material.

This soil is in capability subclass IVe and in woodland suitability subclass 2d.

CnD3—Cincinnati silt loam, 12 to 18 percent slopes, severely eroded. This is a strongly sloping, deep, well drained soil on shoulder and back slopes. The areas are irregular in shape and range from 3 to 25 acres in size.

Typically, the surface layer is yellowish brown silt loam about 6 inches thick. The subsoil is about 44 inches thick. In the upper part it is yellowish brown, firm silty clay loam, and in the lower part it is yellowish brown, firm and brittle clay loam. The substratum to a depth of about 60 inches is dark yellowish brown loam. In some places the substratum is exposed in narrow, deep gullies. In other places the surface layer has gravel and cobbles.

Included with this soil in mapping are small areas of Hickory soils on similar slopes and on steeper slopes and Ava soils on very narrow ridgetops. Hickory soils do not have a fragipan. The included soils make up about 5 percent of the map unit.

Permeability is moderate in the upper part of the subsoil and slow in the fragipan. The available water capacity is moderate. The content of organic matter is moderately low. Surface runoff is rapid. The water table is below a depth of 4 feet. This soil has a tendency to puddle or crust after hard rains, especially in areas where the surface layer is mixed with the subsoil. Root development is restricted below a depth of about 21 inches by a fragipan.

About half of this soil is used for cultivated crops. The other areas are used for hay or pasture or are idle. This soil is poorly suited to corn, soybeans, and wheat. Erosion is the major hazard. The fragipan restricts root development of some plants and causes moisture stress during extended dry periods.

This soil is suited to grasses and legumes for hay or pasture. The selection of legumes and grasses should be based on their tolerance to frost heave and restricted rooting depth. Grasses and legumes also effectively control erosion. Overgrazing or grazing when the soil is wet causes compaction and poor tilth and reduces plant density and hardiness. Proper stocking rates, pasture rotation, timely grazing, and weed control help keep the pasture and soil in good condition.

This soil is suited to trees. Erosion hazard, use of equipment, seedling mortality, and plant competition are management concerns. Logging trails should be planned to minimize erosion. Competing vegetation can be controlled by spraying, cutting, or girdling.

This soil has severe limitations for use as building sites because of slope. Topsoil should be stockpiled and replaced after construction. Erosion can be reduced by revegetating disturbed areas as soon as possible after construction. Slope can be modified by grading, or the building can be designed to fit the slope. This soil has severe limitations for septic tank absorption fields because of slope and slow permeability in the fragipan. It is generally not suited to this use. This soil has severe limitations for local roads and streets because of frost action, low strength, and slope. Slope can be modified by cutting and filling. Drainage ditches along roads help prevent damage from frost action. The road base should be strengthened with suitable material.

This soil is in capability subclass VIe and in woodland suitability subclass 2d.

CrA—Crosby silt loam, 0 to 2 percent slopes. This is a nearly level, deep, somewhat poorly drained soil on broad flats or on knolls in uplands that are surrounded by very poorly drained soils. The areas are irregular in shape and range from 3 to 350 acres in size.

Typically, the surface layer is grayish brown silt loam about 8 inches thick. The subsoil is about 28 inches thick. In the upper part it is pale brown, mottled, firm silty clay loam, and in the lower part it is yellowish brown, mottled firm clay loam. The substratum to a depth of 60 inches is brown, mottled loam. In a few places the soil is grayer, or the silt cap is thicker. Also, in a few places the combined surface layer and subsoil are thicker than 40 inches, and the lower part of the subsoil and substratum have more sand.

Included with this soil in mapping are small areas of Miami soils on slight dome-shaped rises and on breaks along drainageways. Also included are areas of Brookston soils in small swales and very narrow drainageways. The included soils make up about 10 percent of the map unit.

Permeability is slow, and the available water capacity is high. The content of organic matter is moderately low. Surface runoff is slow. The water table is often at a depth of 1 to 3 feet in winter and early in spring. The surface layer is friable and is easily worked within a fairly wide range of moisture content. It does, however, have a tendency to crust or puddle after hard rains. Compact loamy glacial till restricts root development below a depth of about 36 inches.

In most areas this soil is used for cultivated crops. In a few small areas it is used for hay or pasture or as woodland. Subsurface drains and open ditches have been used to drain the soil in most areas.

This soil is well suited to corn, soybeans, and wheat. Wetness is the major limitation. Crop rotation, conservation tillage that leaves crop residue on the surface, cover crops, and green manure crops or other organic material added to the soil help improve fertility and tilth and increase water infiltration.

This soil is well suited to grasses and legumes for hay or pasture. Grasses and legumes should be selected on the basis of the extent of drainage. Overgrazing or grazing when the soil is wet causes compaction and poor tilth and reduces plant density and hardiness. Proper stocking rates, pasture rotation, timely grazing, and weed control help keep the pasture and soil in good condition.

This soil is well suited to trees. The hazards and limitations are generally slight. Plant competition, however, is moderate. Competing vegetation can be controlled by spraying, cutting, or girdling.

This soil has severe limitations for use as building sites because of wetness. Drainage is needed to reduce wetness. This soil has severe limitations for septic tank absorption fields because of wetness and slow permeability. Enlarging the filter field and lowering the water table may help the soil function better as an absorption field. This soil has severe limitations for local roads and streets because of frost action and low strength. Drainage ditches along roads help reduce frost action. The road base should be strengthened with suitable material.

This soil is in capability subclass IIw and in woodland suitability subclass 3o.

CsB2—Crosby-Miami silt loams, 2 to 4 percent slopes, eroded. These are gently sloping, deep, somewhat poorly drained and well drained soils. About 60 percent of the unit is Crosby soil, and about 30 percent is Miami soil. The Crosby soil is in the lower, broader, less sloping areas. The Miami soil is in the higher, more sloping areas. Areas of these soils are so intricately mixed or so small in size that it was not practical to map them separately. The areas are irregular in shape and range from 5 to 50 acres in size.

Typically, the surface layer of the Crosby soil is dark grayish brown silt loam about 8 inches thick. The subsoil is about 20 inches thick. In the upper part it is dark grayish brown, friable silty clay loam; in the middle part it is brown, mottled, firm clay loam; and in the lower part it is grayish brown, mottled, firm clay loam. The substratum to a depth of about 60 inches is yellowish brown, mottled loam. In some places the soil is grayer, and in some places the silt cap is thicker. Also, in a few places the combined surface layer and subsoil are thicker than 40 inches, and the lower part of the subsoil and substratum have more sand.

Typically, the surface layer of the Miami soil is mixed with the subsoil. It is brown silt loam and dark yellowish brown clay loam about 7 inches thick. The subsoil is about 30 inches thick. In the upper part it is dark yellowish brown, firm clay loam; in the middle part it is yellowish brown, firm clay loam, and in the lower part it is dark brown, firm clay loam. The substratum to a depth of about 60 inches is pale brown loam. In some places the lower part of the subsoil is mottled, or the combined surface layer and subsoil are thicker than 40 inches.

Included with these soils in mapping are small areas of Brookston soils in depressions and narrow drainageways. Also included are small areas where the surface of the Crosby and Miami soils is clay loam. The included soils make up about 10 percent of the map unit.

The available water capacity of both the Crosby and Miami soils is high. Permeability of the Crosby soil is slow. Permeability of the Miami soil is moderate in the subsoil and moderately slow in the substratum. The content of organic matter is moderately low in both soils. Surface runoff is medium. The Crosby soil has a water table at a depth of 1 to 3 feet in winter and early in spring. The surface layer of both soils is friable and is easily worked within a fairly wide range of moisture content. It does, however, have a tendency to crust or puddle after hard rains, especially in areas where the surface layer is mixed with the subsoil. Root development is restricted below a depth of about 32 inches by compacted glacial till.

In most areas these soils are used for cultivated crops. In a few small areas they are used for hay or pasture or as woodland. The soils in this map unit are suited to corn, soybeans, and wheat. Erosion is the major hazard. In addition, wetness is a limitation for the Crosby soil. Tile outlet terraces, grassed waterways, or diversions are needed to control surface runoff and erosion. Drainage is needed in the Crosby soil. Conservation tillage that leaves crop residue on the surface, crop rotation, green manure crops or other organic material added to the soil help improve the content of organic matter, soil tilth, and water infiltration, and thus reduce crusting and erosion.

These soils are well suited to grasses and legumes for hay or pasture. Grasses and legumes effectively control erosion. They should be selected on the basis of the extent of drainage.

Overgrazing or grazing when the soil is wet causes compaction and poor tilth and reduces plant density and hardiness. Proper stocking rates, pasture rotation, timely grazing, and weed control help keep the pasture and soil in good condition.

These soils are well suited to trees. The hazards and limitations are generally slight. Plant competition, however, is moderate. Competing vegetation can be controlled by spraying, cutting, or girdling. Species that are tolerant of wetness should be selected.

The Crosby soil has severe limitations for use as building sites because of wetness. Drainage is needed to reduce wetness. Crosby soil has severe limitations for septic tank absorption fields because of wetness and slow permeability. Enlarging the filter field and lowering the water table may help this soil function better as an absorption field. The Crosby soil has severe limitations for local roads and streets because of frost action and low strength. Drainage ditches along roads help reduce frost action. The road base should be strengthened with suitable material.

The Miami soil has slight limitations for use as building sites. It has severe limitations for septic tank absorption fields because of moderately slow permeability. Enlarging the filter field may help the soil function better as an absorption field. Lateral seepage on top of the till occurs in poorly designed systems and may surface downslope. The Miami soil has moderate limitations for local roads and streets because of frost action. Drainage ditches along roads help reduce frost action.

These soils are in capability subclass IIe. The Crosby soil is in woodland suitability subclass 3o, and the Miami soil is in subclass 1o.

EsC2—Elkinsville silt loam, 6 to 12 percent slopes, eroded. This is a moderately sloping, deep, well drained soil on low terraces adjacent to bottom lands. It is rarely flooded. The areas are irregular in shape and range from 3 to 10 acres in size.

Typically, the surface layer is brown silt loam about 5 inches thick. The subsoil is about 59 inches thick. In the upper part it is strong brown, friable and firm silt loam; in the middle part it is strong brown, firm silty clay loam and silt loam; and in the lower part it is yellowish brown, friable silty clay loam. The substratum to a depth of about 80 inches is yellowish brown silty clay loam. In some pedons the surface layer is very dark grayish brown. In some areas the surface layer has been removed by erosion, and the strong brown subsoil is exposed.

Included with this soil in mapping are small areas of Banlic, Bartle, and Pekin soils that have slopes less than 6 percent and small areas of Cincinnati and Hickory soils on toe slopes of valley walls. The included soils make up about 10 percent of the map unit.

Permeability is moderate, and the available water capacity is high. The content of organic matter is moderately low. Surface runoff is medium. The surface layer is friable and is easily worked within a fairly wide range of moisture content. It does, however, have a tendency to crust or puddle after hard rains, especially in areas where the surface layer is mixed with the subsoil.

In most areas this soil is used for cultivated crops. In a few small areas it is used for hay or pasture or as woodland. This soil is suited to corn, soybeans, and small grain. Erosion is the only hazard. Tile outlet terraces, contour farming, diversions, or grassed waterways are needed to control surface runoff and reduce sheet erosion. Conservation tillage that leaves crop residue on the surface, cover crops, and green manure crops or other organic material added to the soil help improve the content of organic matter and tilth and thus reduce crusting and erosion.

This soil is suited to grasses and legumes for hay or pasture. Grasses and legumes effectively control erosion. Overgrazing causes compaction and poor tilth and reduces plant density and hardiness. Proper stocking rates, pasture rotation, timely grazing, and weed control help keep the pasture and soil in good condition.

This soil is well suited to trees. The hazards and limitations are generally slight. Plant competition, however, is moderate. Competing vegetation can be controlled by spraying, cutting, or girdling.

This soil has severe limitations for use as building sites because of flooding. It is generally not suited to this use, and alternate sites should be selected. This soil has moderate limitations for septic tank absorption fields because of slope and rare flooding. Slope can be modified by grading, or the system can be designed to fit the slope. This soil has severe limitations for local roads and streets because of frost action and low strength. Drainage ditches along roads help remove excess water and reduce frost action. The road base should be strengthened with suitable material.

This soil is in capability subclass IIIe and in woodland suitability subclass 1o.

Ev—Evansville silty clay loam. This is a nearly level, deep, poorly drained soil on very low terraces and lakebeds. It is ponded by runoff from adjacent soils. The areas are irregular in shape and range from 10 to 50 acres in size.

Typically, the surface layer is dark grayish brown silty clay loam about 8 inches thick. The subsoil is about 42 inches thick. In the upper part it is gray, mottled, firm silty clay loam, and in the lower part it is grayish brown, mottled, firm silty clay loam. The substratum to a depth of about 60 inches is yellowish brown, mottled, stratified silt loam and silty clay loam. In some places the surface layer has more sand.

Included with this soil in mapping are small areas of Shoals soils in slightly higher positions and small areas of Milford, Patton, and Rensselaer soils in slightly lower positions. The included soils make up about 5 percent of the map unit.

Permeability is moderate, and the available water capacity is high. The content of organic matter is moderate. Surface runoff is slow. The water table is often near or above the surface in winter and early in spring. The surface layer is friable and is easily worked at the proper moisture content. However, it is sticky if worked when wet and forms large clods that become very firm when dry.

In most areas this soil is used for cultivated crops. In a few small areas it is used for hay or pasture or as woodland. This soil is suited to corn, soybeans, and wheat. Wetness is the major limitation. In most areas the soil has been artificially drained. Land smoothing and shallow surface drains help remove excess surface water. Crop rotation, conservation tillage that leaves crop residue on the surface, cover crops, and green manure crops or other organic material added to the soil help improve fertility and tilth and increase water infiltration.

This soil is suited to grasses and legumes for hay or pasture. Grasses and legumes should be selected on the basis of the extent of drainage. Overgrazing or grazing when the soil is wet causes compaction and poor tilth and reduces plant density and hardiness. Proper stocking rates, pasture rotation, timely grazing, and weed control help keep the pasture and soil in good condition.

This soil is suited to trees. Equipment use, seedling mortality, windthrow hazard and plant competition are management concerns. Harvesting may need to be delayed until the soil is dry or frozen. Species tolerant to wetness should be selected. Competing vegetation can be controlled by spraying, cutting, or girdling.

This soil has severe limitations for use as building sites, septic tank absorption fields, and local roads and streets because of ponding. Low strength and frost action are also severe limitations for roads and streets. The soil is generally not suited to these uses, and alternate sites should be selected.

This soil is in capability subclass IIw and in woodland suitability subclass 2w.

FcA—Fincastle silt loam, 0 to 3 percent slopes. This is a nearly level and gently sloping, deep, somewhat poorly drained soil on uplands. It is on broad flats and narrow to moderately broad ridgetops. The areas are irregular or elongated in shape and range from 3 to 200 acres in size.

Typically, the surface layer is grayish brown, mottled silt loam about 10 inches thick. The subsoil is about 42 inches thick. In the upper part it is yellowish brown, mottled, firm silt loam; in the middle part it is brown, mottled firm silty clay loam; and in the lower part it is yellowish brown, mottled, firm clay loam. The underlying material to a depth of about 60 inches is yellowish brown mottled loam that has free carbonates. In some places a thin layer of gravelly sand or sand is between the subsoil and the underlying till. In other places the surface layer and subsoil are thinner.

Included with this soil in mapping are small areas of Brookston or Shoals soils in low swales or narrow drainageways. Also included are small areas of Miami, Russell, and Xenia soils on low knolls or side slopes of drainageways. Also included are areas of somewhat poorly drained soils that have bedrock at a depth of less than 40 inches. The included soils make up about 10 percent of the map unit.

Permeability is moderately slow in the subsoil and slow in the underlying material. The available water capacity is high. The content of organic matter is moderately low. Surface runoff is slow. The water table is often at a depth of 1 to 3 feet in winter and early in spring. The surface layer is friable and is easily worked within a fairly wide range of moisture content. It does, however, have a tendency to puddle and crust after hard rains.

In most areas this soil is used for cultivated crops. In a few areas it is used for hay or pasture or as woodland.

This soil is well suited to corn, soybeans, and wheat. Wetness is the major limitation. In most areas the soil has been artificially drained. Additional subsurface drainage is needed in some areas. Where the slope is long and is 2 to 3 percent, tile outlet terraces help control surface runoff and erosion. Crop rotation, conservation tillage that leaves crop residue on the surface, cover crops, and green manure crops or other organic material added to the soil help improve fertility and tilth and increase water infiltration.

This soil is well suited to grasses and legumes for hay or pasture. Grasses and legumes should be selected on the basis of the extent of drainage. Overgrazing or grazing when the soil is wet causes compaction and poor tilth and reduces plant density and hardiness. Proper stocking rates, pasture rotation, timely grazing, and weed control help keep the pasture and soil in good condition.

This soil is well suited to trees. The hazard and limitations are generally slight. Plant competition, however, is moderate. Competing vegetation can be controlled by spraying, cutting, or girdling.

This soil has severe limitations for use as building sites because of wetness. Adequate drainage is needed to reduce wetness. This soil has severe limitations for septic tank absorption fields because of wetness and slow permeability. Enlarging the filter field and lowering the water table help this soil function better as an absorption field. This soil has severe limitations for local roads and streets because of frost action and low strength. Drainage ditches along roads help reduce frost action. The road base should be strengthened with suitable material.

This soil is in capability subclass IIw and in woodland suitability subclass 3o.

FoA—Fox loam, 0 to 2 percent slopes. This is a nearly level, well drained soil on broad terraces and outwash plains. It is moderately deep to sand and gravelly sand. The areas are irregular in shape and range from 3 to 160 acres in size.

Typically, the surface layer and subsurface layer combined are brown loam about 11 inches thick. The subsoil is about 24 inches thick. In the upper part it is brown, friable and firm loam and clay loam; in the middle part it is reddish brown, firm loam; and in the lower part it is dark brown, friable gravelly loam. The substratum to a depth of about 60 inches is very pale brown stratified gravelly sand and sand that has free carbonates. In some areas the surface layer has gravel and cobbles.

Included with this soil in mapping are small areas of the Martinsville and Ockley soils which have a thicker solum. Also included are small areas of Rensselaer and Whitaker soils in narrow, weakly defined drainageways. The included soils make up about 15 percent of the map unit.

Permeability is moderate in the subsoil and rapid in the substratum. The available water capacity is moderate. The content of organic matter is moderately low. Surface runoff is slow. The surface layer is friable and is easily worked within a wide range of moisture content.

In most areas this soil is used for cultivated crops. In a few small areas it is used for hay, pasture, or trees.

This soil is suited to corn, soybeans, and wheat. Droughtiness is the main limitation. In years when rainfall is below average or poorly distributed, crops are subject to severe damage from drought. Crop residue left on the surface, cover crops, crop rotation, and green manure crops or other organic material added to the soil help improve fertility, increase water infiltration, and maintain the content of organic matter.

This soil is suited to grasses and deep-rooted legumes for hay and pasture. Overgrazing causes soil compaction

and poor tilth and reduces plant density and hardiness. Proper stocking rates, pasture rotation, timely grazing, and weed control help keep the pasture and soil in good condition.

This soil is well suited to trees. The hazards and limitations are generally slight. Plant competition, however, is moderate. Competing vegetation can be controlled by spraying, cutting, or girdling.

This soil has moderate limitations for dwellings without basements because of the shrink-swell potential. Foundations and footings should be properly designed to prevent structural damage caused by the shrinking and swelling of the soil. Foundation drain tile should be used to remove excess water. This soil has slight limitations for houses with basements. This soil has severe limitations for septic tank absorption fields because of rapid permeability in the substratum. Effluent seepage from absorption fields may contaminate nearby shallow wells. This soil has moderate limitations for local roads and streets because of frost action and shrinking and swelling. The road base should be strengthened with suitable material. Drainage ditches along roads help reduce frost action.

This soil is in capability subclass IIs and in woodland suitability subclass 2o.

FoB2—Fox loam, 2 to 6 percent slopes, eroded. This is a gently sloping, well drained soil on low knolls, breaks, or undulating areas on broad terraces and outwash plains. It is moderately deep to sand and gravelly sand. Slopes are short and complex. The areas are irregular or elongated in shape and range from 3 to 60 acres in size.

Typically, the surface layer is dark yellowish brown loam about 8 inches thick. The subsoil is about 27 inches thick. In the upper part it is dark yellowish brown and dark brown, firm clay loam; in the middle part it is dark brown, firm gravelly clay loam; and in the lower part it is dark reddish brown, firm gravelly loam. The substratum to a depth of about 60 inches is pale brown stratified gravelly sand and sand that has free carbonates. In a few places the depth to gravelly sand or sand is less than 24 inches. In some small areas the surface layer is dark brown clay loam or sandy clay loam and has gravel or cobbles.

Included with this soil in mapping are small areas of Martinsville and Ockley soils that have a thicker surface layer and subsoil. The included soils make up about 10 percent of the map unit.

Permeability is moderate in the subsoil and rapid in the substratum. The available water capacity is moderate. The content of organic matter is moderately low. Surface runoff is medium. The surface layer is friable and is easily worked within a wide range of moisture content. It does, however, have a slight tendency to puddle and crust after hard rains, especially in areas where the plow layer is mixed with the subsoil.

In most areas this soil is used for cultivated crops. In a few small areas it is used for hay, pasture, or trees.

This soil is suited to corn, soybeans, and wheat. Erosion is the main hazard. In years when rainfall is below average or poorly distributed, crops are also subject to severe damage from drought. Grassed waterways, contour farming, conservation tillage that leaves crop residue on the surface, and green manure crops or the addition of other organic material help control surface runoff and erosion. These practices help improve the content of organic matter and soil tilth and reduce crusting.

This soil is suited to grasses and deep-rooted legumes for hay and pasture. Grasses and legumes help control erosion. Overgrazing causes compaction and poor tilth and reduces plant density and hardiness. Proper stocking rates, pasture rotation, timely grazing, and weed control help keep the pasture and soil in good condition.

This soil is suited to trees. The hazards and limitations are generally slight. Plant competition, however, is moderate. Competing vegetation can be controlled by spraying, cutting, or girdling.

This soil has moderate limitations for dwellings without basements because of the shrink-swell potential. Foundations and footings should be properly designed to prevent damage caused by the shrinking and swelling of the soil. Foundation drain tile should be used to remove excess water. This soil has slight limitations for dwellings with basements.

This soil has severe limitations for use as septic tank absorption fields because of rapid permeability in the substratum. Effluent seepage from absorption fields may contaminate nearby shallow wells. This soil has moderate limitations for local roads and streets because of the shrink-swell potential and frost action. The road base should be strengthened with suitable material. Drainage ditches along roads help reduce frost action.

This soil is in capability subclass IIe and in woodland suitability subclass 2o.

FxC2—Fox complex, 6 to 15 percent slopes, eroded. The soils making up this complex are moderately sloping and strongly sloping and well drained. They are on side slopes of drainageways, knolls, and breaks of outwash plains and terraces and on side slopes of kames in morainic areas. They are moderately deep to gravelly sand and sand. Slopes are mostly short and irregular and are dominantly 10 to 14 percent. The areas are mostly elongated, but some are rounded or irregular in shape. They range in size from 3 to 15 acres.

About 65 percent of the complex is Fox loam, 6 to 12 percent slopes, eroded, and about 20 percent is Fox clay loam, 8 to 15 percent slopes, severely eroded. Areas of the soils are so intricately mixed or so small that it was not practical to map them separately.

Typically, the surface layer of Fox loam, 6 to 12 percent slopes, eroded, is dark grayish brown loam about 7 inches thick. The subsoil is about 18 inches thick. In the upper part it is brown, firm gravelly clay

loam, and in the lower part it is yellowish brown, firm gravelly loam. The substratum to a depth of about 60 inches is pale brown stratified gravelly sand and sand that has free carbonates. In some places the surface layer is loamy fine sand. In other places cobbles, stones, and pebbles are scattered on the surface. In some places the depth to gravelly sand and sand is less than 24 inches, and in other places it is more than 40 inches.

Typically, the surface layer of Fox clay loam, 8 to 15 percent slopes, severely eroded, is yellowish brown clay loam about 6 inches thick. The subsoil is about 10 inches thick. In the upper part it is brown, firm gravelly clay loam, and in the lower part it is yellowish brown, firm gravelly clay loam. The substratum to a depth of about 60 inches is pale brown stratified gravelly sand and sand that has free carbonates. In some places the surface layer is gravelly clay loam.

Included with this complex in mapping are small areas where the soils are moderately steep to very steep. Also included are small areas where the soils have a surface layer of gravelly sand and sand. These included areas make up about 15 percent of the map unit.

Permeability is moderate in the subsoil and rapid in the substratum. The available water capacity is moderate. The content of organic matter is moderately low. Surface runoff is medium to rapid. The surface layer of Fox loam is friable and is easily worked within a wide range of moisture content. The surface layer of Fox clay loam is plastic when wet and becomes hard and cloddy when dry. It is difficult to work.

In most areas these soils are used as pasture or woodland. In a few small areas they are used for cultivated crops. These soils are poorly suited to corn, soybeans, and wheat. Erosion is the main hazard. Droughtiness is a limitation during dry seasons.

These soils are suited to grasses and legumes for hay or pasture. Grasses and legumes effectively control erosion. Overgrazing causes compaction and poor tilth and reduces plant density and hardiness. Proper stocking rates, pasture rotation, timely grazing, and weed control help keep the pasture and soil in good condition.

These soils are suited to trees. Management concerns for woodland are slight.

These soils have moderate limitations for houses without basements because of shrink-swell potential and slope. The soils have moderate limitations for houses with basements because of slope. Foundations and footings should be properly designed to help prevent structural damage from the shrinking and swelling of the soil. Foundation drain tile should be used to remove excess water. Slope can be modified by grading, or buildings can be designed to fit the slope. These soils have severe limitations for septic tank absorption fields because of the rapid permeability in the substratum. Effluent seepage from absorption fields can contaminate nearby shallow wells. These soils have moderate limitations for local roads and streets because of slope, frost action, and shrink-swell potential. The road base should be strengthened with suitable material. Slope can be modified by cutting and filling. Drainage ditches along roads help reduce frost action.

These soils are in capability subclass IVe and in woodland suitability subclass 2o.

Ge—Genesee silt loam. This is a nearly level, deep, well drained soil on flood plains. This soil is frequently flooded for a brief duration. The areas are irregular in shape and range from 10 to 600 acres in size.

Typically, the surface layer is brown silt loam about 8 inches thick. The substratum extends to a depth of 60 inches. In the upper part it is dark yellowish brown and yellowish brown, friable silt loam, and in the lower part it is yellowish brown, friable loam that has thin strata of sandy loam and sand. In a few places the surface layer has free carbonates. Also included are some soils that have a similar texture but are moderately well drained.

Included with this soil in mapping are a few small areas of Armiesburg soils in very shallow swales and Shoals soils in narrow drainageways and lower lying areas. The included soils make up about 20 percent of the map unit.

Permeability is moderate, and the available water capacity is high. The content of organic matter is moderate. Surface runoff is slow. The surface layer is friable and is easily worked within a fairly wide range of moisture content. It does, however, have a tendency to crust or puddle after hard rains.

In most areas this soil is used for cultivated crops. In a few small areas it is used for hay, pasture, or trees.

This soil is suited to corn and soybeans. Flooding is the main hazard. Controlling johnsongrass is an important management concern along the White River. Crop rotation, conservation tillage that leaves crop residue on the surface, cover crops, and green manure crops or the addition of other organic material help improve fertility and tilth and increase water infiltration.

This soil is suited to grasses and legumes for hay or pasture. Overgrazing or grazing when the soil is wet causes compaction and poor tilth and reduces plant density and hardiness. Proper stocking rates, pasture rotation, timely grazing, and weed control help keep the pasture and soil in good condition.

This soil is well suited to trees. The hazards and limitations are generally slight. Plant competition, however, is moderate. Competing vegetation can be controlled by spraying, cutting, or girdling.

This soil has severe limitations for use as building sites, septic tank absorption fields, and local roads and streets because of flooding. It generally is not suited to these uses, and alternate sites should be selected.

This soil is in capability subclass IIw and in woodland suitability subclass 1o.

GpC—Gilpin silt loam, 6 to 12 percent slopes. This is a moderately sloping, moderately deep, well drained soil on highly dissected uplands. It is on narrow

ridgetops and shoulder slopes of broader ridgetops. The areas are irregular in shape and range from 5 to 30 acres in size.

Typically, the surface layer is dark brown silt loam about 2 inches thick. The subsurface layer is light yellowish brown silt loam about 4 inches thick. The subsoil is about 25 inches thick. In the upper part it is strong brown, friable silt loam that has some fragments of sandstone, and in the lower part it is yellowish brown, firm, very channery loam. The substratum to a depth of about 37 inches is yellowish brown, very channery loam that has large fragments of sandstone. Unweathered fine-grained sandstone bedrock is below a depth of about 37 inches. In a few places the subsoil has less clay.

Included with this soil in mapping are small areas of Wellston and Zanesville soils on broader, less sloping ridgetops and Berks soils on steeper back slopes. The Zanesville soils have a fragipan. Also included are small areas of eroded or severely eroded soils. The included soils make up about 15 percent of the map unit.

Permeability is moderate, and the available water capacity is low. The content of organic matter is moderately low. Surface runoff is medium. Root development is restricted by sandstone bedrock below a depth of 37 inches.

In most areas this soil is wooded. In a few very small areas it is used for pasture.

This soil is suited to corn, soybeans, and wheat. Erosion is the major hazard. In dry seasons droughtiness is also a limitation. Conservation tillage that leaves crop residue on the surface, cover crops, green manure crops, or the addition of other organic material helps increase the content of organic matter, soil tilth, and water infiltration and thus reduces erosion.

This soil is suited to grasses and legumes for hay or pasture. Overgrazing causes compaction and poor tilth and reduces plant density and hardiness. Proper stocking rates, pasture rotation, timely grazing, and weed control help keep the pasture and soil in good condition.

This soil is well suited to trees. Plant competition is the main management concern. Competing vegetation can be controlled by spraying, cutting, or girdling.

This soil has moderate limitations for dwellings with basements because of depth to bedrock and slope. It has moderate limitations for dwellings without basements because of slope and frost action. Buildings should be constructed without basements, or the bedrock should be excavated. Buildings should be designed to fit the slope. Foundation drain tile helps reduce frost action. This soil has severe limitations for septic tank absorption fields because of depth to bedrock. Enlarging the septic tank absorption fields may help overcome this limitation. This soil has moderate limitations for local roads and streets because of frost action and slope. Roads and streets should be designed to fit the slope. Drainage ditches along roads help reduce frost action.

This soil is in capability subclass IIIe and in woodland suitability subclass 2o.

GpD—Gilpin silt loam, 12 to 18 percent slopes. This is a strongly sloping, moderately deep, well drained soil on highly dissected uplands. It is on very narrow ridgetops and shoulder slopes of broader ridgetops. The areas are irregular in shape and range from 5 to 40 acres in size.

Typically, the surface layer is dark brown silt loam about 2 inches thick. The subsurface layer is yellowish brown silt loam about 4 inches thick. The subsoil is about 21 inches thick. In the upper part it is yellowish brown, firm silt loam that has some fragments of sandstone, and in the lower part it is brownish yellow, firm, very channery loam that has many fragments of sandstone. The substratum to a depth of about 36 inches is strong brown, very channery loam. Fine-grained sandstone bedrock is below a depth of about 36 inches. In a few areas the subsoil has less clay.

Included with this soil in mapping are small areas of Wellston and Zanesville soils on broader, less sloping ridgetops and Berks soils on steeper back slopes. The Zanesville soils have a fragipan. Also included are small areas of eroded or severely eroded soils. The included soils make up about 10 percent of this map unit.

Permeability is moderate, and the available water capacity is low. The content of organic matter is moderately low. Surface runoff is rapid. Root development is restricted by sandstone bedrock below a depth of 36 inches.

In most areas this soil is in woodland. In a few very small areas it is in pasture.

This soil is poorly suited to corn, soybeans, and wheat. Erosion is the major hazard. In dry seasons droughtiness is also a limitation. Conservation tillage that leaves crop residue on the surface, cover crops, and green manure crops or the addition of other organic material help increase the content of organic matter and water infiltration and improve tilth. They also help reduce erosion.

This soil is suited to grasses and legumes for hay or pasture. Overgrazing causes compaction and poor tilth and reduces plant density and hardiness. Proper stocking rates, pasture rotation, timely grazing, and weed control help keep the pasture and soil in good condition.

This soil is well suited to trees. Management concerns for woodland are slight.

This soil has severe limitations to use as building sites, septic tank absorption fields, and local roads and streets because of slope. Depth to rock is also a severe limitation for septic tank absorption fields. The soil generally is not suited to these uses.

This soil is in capability subclass IVe and in woodland suitability subclass 2o.

GpE—Gilpin silt loam, 18 to 25 percent slopes. This is a moderately steep, moderately deep, well drained soil on highly dissected uplands. It is on very narrow ridgetops and lower shoulder slopes of broader ridgetops and head slopes of drainageways. The areas are irregular in shape and range from 4 to 100 acres in size.

Typically, the surface layer is very dark brown and yellowish brown silt loam about 4 inches thick. The subsoil is about 20 inches thick. In the upper part it is yellowish brown, firm silt loam and in the lower part it is strong brown, firm silt loam that is about 15 percent coarse fragments. The substratum to a depth of about 30 inches is yellowish brown, very channery loam, and to a depth of 36 inches it is weathered sandstone bedrock that is about 5 percent soil material. Fine-grained sandstone bedrock is below a depth of 36 inches. In a few places the subsoil has less clay.

Included with this soil in mapping are small areas of Wellston and Zanesville soils on broader, less sloping ridgetops and Berks soils on steeper back slopes. The Zanesville soils have a fragipan. Also included are small areas of eroded or severely eroded soils. The included soils make up about 20 percent of the map unit.

Permeability is moderate, and the available water capacity is low. The content of organic matter is moderately low. Surface runoff is rapid. Root development is restricted below a depth of 34 inches by sandstone bedrock.

In most areas this soil is in woodland. In a few very small areas it is used for pasture.

This soil is generally not suited to corn, soybeans, and small grains. Erosion is the major hazard. In the latter part of the growing season droughtiness is also a limitation. Cultivated areas should be replanted to trees.

This soil is poorly suited to grasses and legumes for hay or pasture. Overgrazing causes compaction and poor tilth and reduces plant density and hardiness. Proper stocking rates, pasture rotation, timely grazing, and weed control help keep the pasture and soil in good condition.

This soil is suited to trees. Erosion hazard, equipment limitation, seedling mortality, and plant competition are management concerns. Logging trails should be placed on the contour to help reduce erosion. Because the soil is moderately steep, operating some machinery is difficult. Some replanting of seedings may be necessary. Plant competition can be controlled by cutting, spraying, or girdling.

This soil has severe limitations to use as building sites, septic tank absorption fields, and local roads and streets because of slope. It is generally not suited to these uses.

This soil is in capability subclass VIe and in woodland suitability subclass 2r.

GrC—Grayford silt loam, 6 to 12 percent slopes. This is a moderately sloping, deep, well drained soil on uplands. It is on side slopes of knolls and sinkholes. The areas are irregular in shape and range from 3 to 20 acres in size.

Typically, the surface layer is dark yellowish brown silt loam about 9 inches thick. The subsoil is about 58 inches thick. In the upper part it is yellowish brown, friable and firm silty clay loam; in the part below that it is yellowish brown, firm silt loam; in the part below that it is reddish brown firm silty clay loam; and in the lower part it is red, firm clay. Limestone bedrock is below a depth of 67 inches. In some places the surface layer is reddish brown. In other places the surface layer and subsoil have more silt.

Included with this soil in mapping are small areas of Wakeland and Wilbur soils in the bottom of sinkholes. Also included are small areas of gently sloping Alford soils that formed entirely in loess. The included soils make up about 10 percent of the map unit.

Permeability is moderate, and the available water capacity is high. The content of organic matter is moderately low. Surface runoff is medium. The surface layer is friable and is easily worked within a fairly wide range of moisture content. It does, however, have a tendency to crust or puddle after hard rains, especially in areas where the plow layer is mixed with the subsoil.

In most areas this soil is used for cultivated crops, hay, or pasture. In a few small areas it is used as woodland. This soil is suited to corn, soybeans, and wheat. If the soil is used for cultivated crops, erosion is the main hazard. Tile outlet terraces, contour farming, diversions, grassed waterways, or grade stabilization structures are needed to control surface runoff and erosion. Conservation tillage that leaves crop residue on the surface, cover crops, green manure crops, or the addition of other organic material helps improve the content of organic matter and tilth and thus reduces crusting and erosion.

This soil is well suited to grasses and legumes for hay or pasture. Grasses and legumes effectively control erosion. Overgrazing causes compaction and poor tilth and reduces plant density and hardiness. Proper stocking rates, pasture rotation, timely grazing, and weed control help keep the pasture and soil in good condition.

This soil is well suited to trees. The hazards and limitations are generally slight. Plant competition, however, is moderate. Competing vegetation can be controlled by spraying, cutting, or girdling.

This soil has moderate limitations for use as building sites because of the shrink-swell potential and the slope. Foundations, footings, and basement walls should be properly designed to help prevent structural damage caused by the shrinking and swelling of the soils. Foundation drain tile helps remove excess water. This soil has moderate limitations for septic tank absorption fields because of permeability and slope. Enlarging the filter field may help overcome the moderate permeability. Shaping the land and installing the absorption field across the slope help overcome the limitation of slope. Lateral seepage may occur in poorly designed systems, and the effluent may surface. This soil has severe limitations for local roads and streets because of frost action and low strength. Drainage ditches along roads and streets help prevent frost action. The road base should be strengthened with suitable material.

This soil is in capability subclass IIIe and in woodland suitability subclass 1o.

GrD2—Grayford silt loam, 12 to 18 percent slopes, eroded. This is a strongly sloping, deep, well drained soil on side slopes of sinkholes on uplands. The areas are irregular in shape and range from 3 to 15 acres in size.

Typically, the surface layer is brown silt loam about 6 inches thick. The subsoil is about 50 inches thick. In the upper part it is brown, firm silty clay loam; in the middle part it is dark brown, firm clay loam; and in the lower part it is yellowish red, firm clay. Limestone bedrock is below a depth of about 56 inches. In some places the surface layer is brown silty clay loam.

Included with this soil in mapping are small areas of soils where bedrock outcrops at the bottom of sinkholes. These inclusions make up about 10 percent of the map unit.

Permeability is moderate, and the available water capacity is high. The content of organic matter is moderately low. Surface runoff is rapid. The surface layer is friable and is easily worked within a fairly wide range of moisture content. It does, however, have a tendency to puddle and crust after hard rains, especially in areas where the plow layer is mixed with the subsoil.

In most areas this soil is used for hay or pasture. In a few small areas it is used for trees or cultivated crops.

This soil is poorly suited to corn, soybeans, and small grains. If the soil is used for cultivated crops, erosion is the main hazard. Conservation tillage that leaves residue on the surface, crop rotation, cover crops, green manure crops, or the addition of other organic material helps improve the content of organic matter and tilth and thus reduces crusting and erosion.

This soil is suited to grasses and legumes for hay or pasture. Grasses and legumes effectively control erosion. Overgrazing causes compaction and poor tilth and reduces plant density and hardiness. Proper stocking rates, pasture rotation, timely grazing, and weed control help keep the pasture and soil in good condition.

This soil is well suited to trees. The hazard and limitations are generally slight. Plant competition, however, is moderate. Competing vegetation can be controlled by spraying, cutting, or girdling.

This soil has severe limitations for use as building sites because of slope. The slope can be modified by grading, or buildings can be designed to fit the slope. This soil has severe limitations for septic tank absorption fields because of slope. Shaping the land and installing the absorption field across the slope help overcome this limitation. This soil has severe limitations for local roads and streets because of frost action, slope, and low strength. Drainage ditches along roads and streets help prevent damage from frost action. The road base should be strengthened with suitable material.

This soil is in capability subclass IVe and in woodland suitability subclass 1o.

Ha—Haymond silt loam. This is a nearly level, deep, well drained soil on narrow to moderately broad flood plains of creeks. It is frequently flooded. The areas are elongated or irregular in shape and range from 3 to 80 acres in size.

Typically, the surface layer is brown silt loam about 11 inches thick. The substratum extends to a depth of about 60 inches. In the upper part it is dark yellowish brown silt loam, and in the lower part it is brown and light brownish gray, stratified fine sandy loam and loamy sand. In a few pedons the surface layer is grayish brown silty clay loam. In other pedons thin smears of sand are on the surface. The surface layer and upper part of the substratum are strongly acid in some pedons.

Included with this soil in mapping are small areas of Wakeland and Wilbur soils in slightly lower positions and in very narrow meandering drainageways. The included soils make up about 15 percent of this map unit.

Permeability is moderate, and the available water capacity is very high. The content of organic matter is moderately low. Surface runoff is slow. The surface layer is friable and is easily worked within a fairly wide range of moisture content.

In about half of the areas this soil is used for cultivated crops. In the other areas it is used for hay, pasture, or trees.

This soil is suited to corn and soybeans, but it is poorly suited to wheat. Flooding is the major hazard. Crop rotation, conservation tillage that leaves crop residue on the surface, cover crops, green manure crops, or the addition of other organic material helps improve fertility and tilth and increases water infiltration.

This soil is suited to grasses and legumes for hay or pasture. Overgrazing or grazing when the soil is wet causes compaction and poor tilth and reduces plant density and hardiness. Proper stocking rates, pasture rotation, timely grazing, and weed control help keep the pasture and soil in good condition.

This soil is well suited to trees. The hazards and limitations are generally slight. Plant competition, however, is moderate. Competing vegetation can be controlled by spraying, cutting, or girdling.

This soil has severe limitations for use as building sites, septic tank absorption fields, and local roads and streets because of flooding. Frost action is also a severe limitation for roads and streets. The soil is generally not suited to these uses, and alternate sites should be selected.

This soil is in capability subclass IIw and in woodland suitability subclass 1o.

HkF—Hickory loam, 18 to 50 percent slopes. This is a moderately steep to very steep, deep, well drained soil on side slopes and head slopes of strongly dissected uplands. The areas are irregular in shape and range in size from 5 to 300 acres in size.

Typically, the surface layer is very dark grayish brown loam about 4 inches thick. The subsurface layer is pale brown loam about 6 inches thick. The subsoil is about 60 inches thick. In the upper part it is yellowish brown, firm

clay loam; in the middle part it is strong brown and yellowish brown, firm clay loam; and in the lower part it is yellowish brown, very firm loam. The substratum to a depth of about 75 inches is yellowish brown loam that has free carbonates. In a few places the combined surface layer and subsoil are thicker than 70 inches. In a few places the subsoil and substratum have more sand and gravel.

Included with this soil in mapping are small areas of Cincinnati and Ava soils on narrow ridgetops, Wilbur and Wakeland soils in long narrow drainageways, and Berks and Markland soils on lower side slopes. These included soils make up about 15 percent of this map unit.

Permeability is moderate, and the available water capacity is high. The content of organic matter is moderately low. Surface runoff is very rapid.

In most areas this soil is used as woodland. In a few small areas it is used for pasture.

This soil is generally not suited to use as cropland or pasture because of steep slopes.

This soil is well suited to trees. However, erosion is a severe hazard, and the use of equipment is severely limited. Logging trails should be planned to minimize erosion. Plant competition is a moderate limitation. Competing vegetation can be controlled by spraying, cutting, or girdling.

This soil has severe limitations for use as building sites, septic tank absorption fields, and local roads and streets because of slope. Low strength is also a severe limitation for roads and streets. This soil is generally not suited to these uses, and alternate sites should be selected.

This soil is in capability subclass VIIe and in woodland suitability subclass 1r.

IvA—Iva silt loam, 0 to 3 percent slopes. This is a nearly level and gently sloping, deep, somewhat poorly drained soil on broad, level or gently undulating uplands. The areas are irregular in shape and range from 10 to 100 acres in size.

Typically, the surface layer is grayish brown silt loam about 7 inches thick. The subsurface layer is light brownish gray silt loam about 4 inches thick. The subsoil is about 42 inches thick. In the upper part it is yellowish brown, mottled, firm silt loam; in the middle part it is yellowish brown, mottled, firm silty clay loam; and in the lower part it is yellowish brown, mottled, firm silt loam. The substratum to a depth of about 73 inches is mottled, yellowish brown and light brownish gray, friable silt loam. In some places the surface layer and subsoil are grayer. In other places the upper part of the subsoil is browner.

Included with this soil in mapping are very small areas of Vigo soils in slightly lower positions and very poorly drained soils that have a thick, very dark brown surface layer and are in slight depressions. Also included are very small areas of Alford, Ava, and Cincinnati soils that have slopes of more than 3 percent. The included soils make up about 15 percent of this map unit.

Permeability is slow, and the available water capacity is high. The content of organic matter is moderately low. Surface runoff is slow. The water table is often at a depth of 1 to 3 feet in winter and early in spring. The surface layer is friable and is easily worked within a fairly wide range of moisture content. It does, however, have a tendency to puddle and crust after hard rains.

In most areas this soil is used for cultivated crops. In a few small areas it is used for hay, pasture, or trees. This soil is suited to corn, soybeans, and wheat. Wetness is the major limitation. In most areas the soil has been artificially drained. Land smoothing and shallow surface drains help remove excess surface water. Crop rotation, conservation tillage that leaves crop residue on the surface, cover crops, green manure crops, or the addition of other organic material helps improve fertility and tilth and increases water infiltration.

This soil is well suited to grasses and legumes for hay or pasture. Grasses and legumes should be selected on the basis of the extent of drainage. Overgrazing or grazing when the soil is wet causes compaction and poor tilth and reduces plant density and hardiness. Proper stocking rates, pasture rotation, timely grazing, and weed control help keep the pasture and soil in good condition.

This soil is suited to trees. Plant competition is the main management concern. Competing vegetation can be controlled by cutting, spraying, or girdling.

This soil has severe limitations to use as building sites because of wetness. Foundation drain tile should be used to help remove excess water. This soil has severe limitations for septic tank absorption fields because of wetness and slow permeability. Enlarging the filter field and lowering the water table help this soil function better as an absorption field. This soil has severe limitations for local roads and streets because of frost action and low strength. Drainage ditches along roads remove excess water and help reduce frost action. The road base should be strengthened with suitable material.

This soil is in capability subclass IIw and in woodland suitability subclass 2w.

MbD2—Markland silt loam, 12 to 18 percent slopes, eroded. This is a strongly sloping, deep, well drained soil on back slopes of strongly dissected slack water terraces and lake plains. The areas are irregular in shape and range from 5 to 60 acres in size.

Typically, the surface layer is dark yellowish brown silt loam about 6 inches thick. The subsoil is about 23 inches thick. In the upper part it is yellowish brown, very firm silty clay loam, and in the lower part it is yellowish brown, very firm silty clay. The substratum to a depth of about 60 inches is yellowish brown stratified silty clay loam and silty clay that has free carbonates. In places the depth to free carbonates is less than 20 inches, and in other places it is more than 45 inches.

Included with this soil in mapping are small areas of Chetwynd, Hickory, and Princeton soils in slightly higher

positions and small areas of somewhat poorly drained soils on nearly level and gently sloping ridgetops. The included soils make up about 15 percent of this map unit.

Permeability is slow, and the available water capacity is moderate. The content of organic matter is moderately low. Surface runoff is rapid. The water table is often at a depth of 3 to 6 feet early in spring. The surface layer is friable and is easily worked within a fairly wide range of moisture content. It does, however, have a tendency to puddle and crust after hard rains, especially in areas where the plow layer is mixed with the subsoil.

In most areas this soil is used as woodland. In a few small areas it is used for hay or pasture.

This soil is generally not suitable for cultivated crops because of slope and the severe hazard of erosion.

This soil is well suited to trees. Seedling mortality and plant competition are the main management concerns. Some replanting of seedlings may be necessary. Competing vegetation can be controlled by cutting, spraying, or girdling.

This soil has severe limitations for use as building sites because of shrink-swell potential and slope. Low strength is an additional limitation for local roads and streets. This soil has severe limitations for septic tank absorption fields because of slow permeability, wetness, and slope. It is generally not suited to these uses, and alternate sites should be selected.

This soil is in capability subclass VIe and in woodland suitability subclass 2c.

MbE—Markland silt loam, 18 to 25 percent slopes. This is a moderately steep, deep, well drained soil on side slopes of strongly dissected slack water terraces and lake plains. The areas are irregular in shape and range from 10 to 50 acres in size.

Typically, the surface layer is dark brown silt loam about 3 inches thick. The subsurface layer is dark yellowish brown silt loam about 5 inches thick. The subsoil is about 19 inches thick. In the upper part it is yellowish brown, very firm silty clay loam; in the middle part it is yellowish brown and dark yellowish brown, very firm silty clay; and in the lower part it is yellowish brown, firm silty clay. The substratum to a depth of about 60 inches is yellowish brown silty clay that has free carbonates. In some pedons the depth to free carbonates is less than 20 inches or more than 45 inches.

Included with this soil in mapping are small areas of Chetwynd, Hickory, and Princeton soils in slightly higher positions. The included soils make up about 15 percent of the map unit.

Permeability is slow, and the available water capacity is moderate. The content of organic matter is moderately low. Surface runoff is rapid. The water table is often at a depth of 3 to 6 feet in winter and early in spring.

In most areas this soil is in woodland. In a few small areas it is in pasture.

This soil is suited to trees. The hazard of erosion, equipment limitation, seedling mortality, and plant competition are management concerns. Logging roads should be constructed on the contour where possible. The use of some machinery is restricted on the steeper soils. Some replanting of seedlings may be necessary. Competing vegetation can be controlled by cutting, spraying, or girdling.

This soil has severe limitations for use as building sites because of shrink-swell potential and slope. It has severe limitations for septic tank absorption fields because of slow permeability, wetness, and slope, and it has severe limitations for local roads and streets because of shrink-swell potential, low strength, and slope. This soil is generally not suited to these uses, and alternate sites should be selected.

This soil is in capability subclass VIe and in woodland suitability subclass 2c.

MeA—Martinsville loam, 0 to 2 percent slopes. This is a nearly level, deep, well drained soil on broad terraces and outwash plains. The areas are irregular in shape and range from 3 to 150 acres in size.

Typically, the surface layer is brown loam about 9 inches thick. The subsoil is about 41 inches thick. In the upper part it is yellowish brown, firm loam; in the middle part it is yellowish brown, firm clay loam; and in the lower part it is yellowish brown, friable sandy loam. The substratum to a depth of about 60 inches is stratified yellowish brown mottled silty clay loam, sand, silt loam, and sandy loam. In a few places the lower part of the subsoil is mottled. In a few places the surface layer and subsoil have more sand, or the lower part of the subsoil has more gravel.

Included with this soil in mapping are a few small areas of Rensselaer and Whitaker soils in depressions and drainageways. The included soils make up about 10 percent of this map unit.

Permeability is moderate, and the available water capacity is high. The content of organic matter is moderately low. Surface runoff is slow. The surface layer is friable and is easily worked within a wide range of moisture content.

In most areas this soil is used for cultivated crops. In a few small areas it is used for hay, pasture, or trees.

This soil is well suited to corn, soybeans, and wheat. Crop rotation, conservation tillage that leaves crop residue on the surface, cover crops, green manure crops, or the addition of other organic material helps improve fertility and increases water infiltration.

This soil is well suited to grasses and legumes for hay or pasture. Overgrazing causes compaction and poor tilth and reduces plant density and hardiness. Proper stocking rates, pasture rotation, timely grazing and weed control help keep the pasture and soil in good condition.

This soil is well suited to trees. The hazards and limitations are generally slight. Plant competition, however, is moderate. Competing vegetation can be controlled by spraying, cutting, or girdling.

This soil has moderate limitations for use as building sites because of shrink-swell potential. Foundations, footings, and basement walls should be properly designed to help prevent structural damage caused by the shrinking and swelling of the soil. Foundation drain tile should be used to help remove excess water. This soil has slight limitations for septic tank absorption fields. It has moderate limitations for local roads and streets because of low strength and frost action. The road base should be strengthened with suitable material. Drainage ditches along roads help reduce frost action.

This soil is in capability class I and in woodland suitability subclass 1o.

MeB—Martinsville loam, 2 to 6 percent slopes. This is a gently sloping, deep, well drained soil on slight rises on breaks along drainageways on broad terraces and outwash plains. The areas are irregular in shape and range from 3 to 10 acres in size.

Typically, the surface layer is dark yellowish brown loam about 8 inches thick. The subsoil is about 36 inches thick. In the upper part it is yellowish brown, friable loam, in the middle part it is strong brown, firm clay loam, and in the lower part it is yellowish brown, firm loam. The substratum to a depth of about 60 inches is yellowish brown stratified sandy loam, silt loam, clay loam, and loam. In a few pedons the subsoil is mottled. In places the surface layer and subsoil have more sand, or the lower part of the subsoil has more gravel.

Included with this soil in mapping are a few small areas of Rensselaer and Whitaker soils in depressions and drainageways. Also included are small areas of severely eroded soils. The included soils make up about 5 percent of this map unit.

Permeability is moderate, and the available water capacity is high. The content of organic matter is moderately low. Surface runoff is medium. The surface layer is friable and is easily worked within a wide range of moisture content.

In most areas this soil is used for cultivated crops. In a few small areas it is used for hay, pasture, or trees.

This soil is well suited to corn, soybeans, and wheat. If this soil is used for cultivated crops, erosion is the only hazard. Tile outlet terraces, diversions, contour farming, grassed waterways, or grade stabilization structures are needed to control surface runoff and erosion. Conservation tillage that leaves crop residue on the surface, crop rotation, cover crops, and green manure crops or other organic material added to the soil help maintain or improve the content of organic matter and tilth. They also help control erosion.

This soil is well suited to grasses and legumes for hay or pasture. Grasses and legumes effectively control erosion. Overgrazing causes compaction and poor tilth and reduces plant density and hardiness. Proper stocking rates, pasture rotation, timely grazing, and weed control help keep the pasture and soil in good condition.

This soil is well suited to trees (fig. 2). The hazards and limitations are generally slight. Plant competition, however, is moderate. Competing vegetation can be controlled by spraying, cutting, or girdling.

This soil has moderate limitations for use as building sites because of the shrink-swell potential. Foundations, footings, and basement walls should be properly designed to help prevent structural damage caused by the shrinking and swelling of the soil. Foundation drain tile should be used to help remove excess water. This soil has slight limitations for septic tank absorption fields. It has moderate limitations for local roads and streets because of low strength and frost action. The road base should be strengthened with suitable material. Drainage ditches along roads help reduce frost action.

This soil is in capability subclass IIe and in woodland suitability subclass 1o.

MnB2—Miami silt loam, 2 to 6 percent slopes, eroded. This is a gently sloping, deep, well drained soil on knolls, ridgetops, and short side slopes and head slopes of drainageways. The areas are irregular in shape and range in size from 3 to 50 acres in size.

Typically, the surface layer is brown silt loam about 7 inches thick. The subsoil is about 25 inches thick. In the upper part it is strong brown, firm silty clay loam; in the middle part it is strong brown, firm clay loam; and in the lower part it is yellowish brown, firm clay loam. The substratum to a depth of about 60 inches is brown and light yellowish brown loam that has free carbonates. The silt mantle is thicker in some undulating morainic areas. In some pedons a thin layer of gravelly sand and sand is between the subsoil and the underlying loamy till.

Included with this soil in mapping are small areas of Brookston and Crosby soils in shallow depressions and drainageways. In other small areas the upper part of the subsoil has been mixed with the surface soil by plowing, and the surface layer is clay loam or silty clay loam. The included soils make up about 15 percent of this map unit.

Permeability is moderate in the subsoil and moderately slow in the substratum. The available water capacity is high. The content of organic matter is moderately low. Surface runoff is medium. The surface layer is friable and is easily worked within a fairly wide range of moisture content. It does, however, have a tendency to crust or puddle after hard rains, especially in areas where the surface soil is mixed with the subsoil. Root development is restricted below a depth of about 32 inches by compacted loamy glacial till.

In most areas this soil is used for cultivated crops. In a few small areas it is used for hay, pasture, or trees. This soil is suited to corn, soybeans, and wheat. If the soil is used for cultivated crops, erosion is the only hazard. Tile outlet terraces, diversions, contour farming, grassed waterways, or grade stabilization structures are needed to control surface runoff and erosion. Contour farming, conservation tillage that leaves crop residue on the surface, crop rotation, cover crops, green manure crops, or the addition of other organic material helps improve

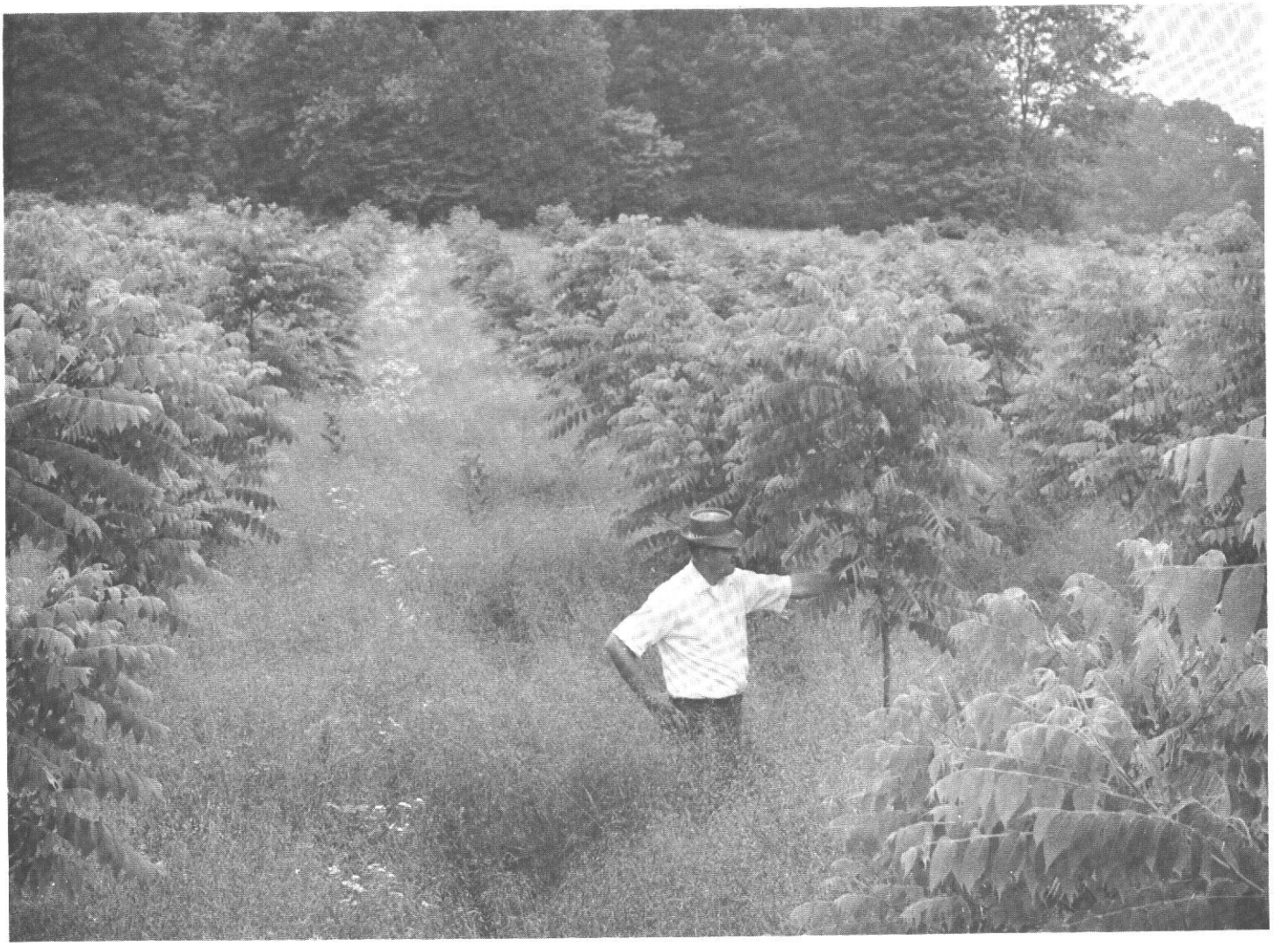


Figure 2.—A 4-year-old walnut plantation on Martinsville loam, 2 to 6 percent slopes. This soil is well suited to trees.

and maintain organic matter and tilth and thus reduces crusting and erosion.

This soil is well suited to grasses and legumes for hay or pasture. Grasses and legumes effectively control erosion. Overgrazing causes compaction and poor tilth and reduces plant density and hardiness. Proper stocking rates, pasture rotation, timely grazing, and weed control help keep the pasture and soil in good condition.

This soil is well suited to trees. The hazards and limitations are generally slight. Plant competition, however, is moderate. Competing vegetation can be controlled by spraying, cutting, or girdling.

This soil has slight limitations for use as building sites. Foundation drain tile should be used to remove excess water. This soil has severe limitations for septic tank absorption fields because of moderately slow permeability. Enlarging the filter field helps overcome this limitation. Lateral seepage on top of the till occurs in poorly designed systems and may travel several feet before surfacing. This soil has moderate limitations for local roads and streets because of frost action. Drainage ditches along roads help reduce frost action.

This soil is in capability subclass IIe and in woodland suitability subclass 1o.

MnC2—Miami silt loam, 6 to 12 percent slopes, eroded. This is a moderately sloping, deep, well drained soil on side slopes of knolls and drainageways. The areas are irregular or elongated in shape and range from 3 to 40 acres in size.

Typically, the surface layer is dark yellowish brown silt loam about 7 inches thick. The subsoil is yellowish

brown, firm clay loam about 30 inches thick. The substratum to a depth of about 60 inches is brown loam that has free carbonates. The silt mantle is thicker in some morainic areas. In some small areas a thin layer of gravelly material is between the subsoil and the underlying loamy till.

Included with this soil in mapping are small areas of Brookston and Crosby soils in shallow depressions or drainageways and Shoals soils in short narrow drainageways. In other small areas the upper part of the subsoil has been mixed with the surface soil by plowing, and the surface layer is clay loam or silty clay loam. The included soils make up about 10 percent of this map unit.

Permeability is moderate in the subsoil and moderately slow in the substratum. The available water capacity is high. The content of organic matter is moderately low. Surface runoff is medium. The surface layer is friable and is easily worked within a fairly wide range of moisture content. It does, however, have a tendency to puddle and crust after hard rains, especially in areas where the surface soil is mixed with the subsoil. Root development is restricted below a depth of about 37 inches by compacted loamy glacial till.

In about half of the areas this soil is used for cultivated crops. In the other areas it is used as hayland, pasture, or woodland.

This soil is suited to corn, soybeans, and wheat. If this soil is used for cultivated crops, erosion is the main hazard. Tile outlet terraces, contour farming, diversions, grassed waterways, or grade stabilization structures are needed to control surface runoff and erosion. Conservation tillage that leaves crop residue on the surface, crop rotation, cover crops, and green manure crops or the addition of other organic material help improve the content of organic matter and tilth and thus reduce crusting and erosion.

This soil is well suited to grasses and legumes for hay or pasture. Grasses and legumes effectively control erosion. Overgrazing causes compaction and poor tilth and reduces plant density and hardiness. Proper stocking rates, pasture rotation, timely grazing, and weed control help keep the pasture and soil in good condition.

This soil is well suited to trees. The hazards and limitations are generally slight. Plant competition, however, is moderate. Competing vegetation can be controlled by spraying, cutting, or girdling.

This soil has moderate limitations for use as building sites because of slope. Slope can be modified by grading, or buildings can be designed to fit the slope. Foundation drain tile should be used to remove excess water. This soil has severe limitations for septic tank absorption fields because of moderately slow permeability. Enlarging the filter field helps overcome this limitation. Lateral seepage on top of the till occurs in poorly designed systems, and effluent may travel several feet before surfacing. This soil has moderate limitations for local roads and streets because of slope and frost action. Drainage ditches along roads help reduce frost action.

This soil is in capability subclass IIIe and in woodland suitability subclass 1o.

MnD2—Miami silt loam, 12 to 18 percent slopes, eroded. This is a strongly sloping, deep, well drained soil on back slopes, foot slopes, and nose slopes of ridges, high knolls, and drainageways. The areas are irregular or elongated in shape and range from 3 to 30 acres in size.

Typically, the surface layer is brown silt loam about 6 inches thick. The subsoil is yellowish brown, firm clay loam about 26 inches thick. The substratum to a depth of about 60 inches is brown loam that has free carbonates. The silt mantle is thicker in some morainic areas. In some small areas that have not been farmed or that have been wooded for many years, the surface layer is dark grayish brown. In other places a thin layer of gravelly sand or sand is between the subsoil and till.

Included with this soil in mapping are small areas of Crosby soils on ridgetops and Shoals soils in very narrow drainageways. In other small areas the upper part of the subsoil has been mixed with the surface layer by plowing, and the surface layer is clay loam. The included soils make up about 10 percent of this map unit.

Permeability is moderate in the subsoil and moderately slow in the substratum. The available water capacity is high. The content of organic matter is moderately low. Surface runoff is rapid. The surface layer is friable and is easily worked within a fairly wide range of moisture content. It does, however, have a tendency to puddle and crust after hard rains, especially in areas where the surface soil is mixed with the subsoil. Root development is restricted below a depth of about 32 inches by compacted loamy glacial till.

In most areas this soil is used for pasture or hay. In a few small areas it is used for cultivated crops or trees.

This soil is poorly suited to corn and soybeans. It is suited to wheat. Erosion is the main hazard if this soil is used for cultivated crops. Tile outlet terraces, contour farming, diversions, grassed waterways, and grade stabilization structures are needed to control erosion and runoff. Conservation tillage that leaves crop residue on the surface, crop rotation, cover crops, and green manure crops or the addition of other organic material help improve the content of organic matter and tilth and thus reduce crusting and erosion.

This soil is well suited to grasses and legumes for hay or pasture. Grasses and legumes effectively control erosion. Overgrazing causes compaction and poor tilth and reduces plant density and hardiness. Proper stocking rates, pasture rotation, timely grazing, and weed control help keep the pasture and soil in good condition.

This soil is well suited to trees. The hazards and limitations are generally slight. Plant competition, however, is moderate. Competing vegetation can be controlled by spraying, cutting, or girdling.

This soil has severe limitations for use as building sites because of slope. Slope can be modified by grading, or buildings can be designed to fit the slope. Foundation drain tile should be used to remove excess water. This soil has severe limitations for septic tank absorption fields because of moderately slow permeability and slope. It is generally not suited to this use. Lateral seepage on top of the till occurs in many systems, and effluent may travel several feet before surfacing. This soil has severe limitations for local roads and streets because of slope. Roads should be designed to fit the slope.

This soil is in capability subclass IVe and in woodland suitability subclass 1o.

MnE—Miami silt loam, 18 to 25 percent slopes. This is a moderately steep, deep, well drained soil between uplands and terraces or bottom lands. It is on side slopes and nose slopes of drainageways and breaks. The areas are irregular or elongated in shape and range from 10 to 40 acres in size.

Typically, the surface layer is brown silt loam ad yellowish brown silt loam about 6 inches thick. The subsoil is yellowish brown, firm clay loam about 22 inches thick. The substratum to a depth of about 60 inches is brown loam that has free carbonates. In some places deep gullies have formed. In other places the surface layer is very dark grayish brown, and the surface layer and subsoil have more sand.

Included with this soil in mapping are small areas of Shoals soils in very narrow drainageways. The included soil makes up about 10 percent of this map unit.

Permeability is moderate in the subsoil and moderately slow in the substratum. The available water capacity is high. The content of organic matter is moderately low. Surface runoff is rapid. The surface layer is friable and is easily worked within a fairly wide range of moisture content.

In most areas this soil is used as woodland or pasture. This soil is generally not suited to cultivated crops, small grain, hay, or pasture because of steep slopes.

This soil is well suited to trees. Erosion is a moderate hazard, and the use of equipment is moderately limited. Plant competition is also moderate. Logging roads or trails should be placed on the contour where possible to help reduce erosion. The use of some equipment is restricted by slope. Competing vegetation can be controlled by cutting, spraying, or girdling.

This soil has severe limitations for use as building sites, septic tank absorption fields, and local roads and streets because of steep slope. It is generally not suited to these uses, and alternate sites should be selected.

This soil is in capability subclass VIe and in woodland suitability subclass 1r.

MnF—Miami loam, 25 to 50 percent slopes. This is a steep to very steep, deep, well drained soil on side slopes and nose slopes of breaks between uplands and terraces or bottom lands. The areas are irregular or elongated in shape and range from 5 to 80 acres in size.

Typically, the surface layer is loam about 6 inches thick. In the upper part it is grayish brown, and in the lower part it is yellowish brown. The subsoil is yellowish brown, firm clay loam about 18 inches thick. The substratum to a depth of about 60 inches is brown loam that has free carbonates. In some small areas the subsoil has more sand. In other areas free carbonates are closer to the surface. In a few places the surface layer is clay loam. Some areas are gullied. In places the soil has free carbonates at the surface. In places the surface layer has cobblestones or gravel.

Included with this soil in mapping are small areas of Shoals soils in long narrow bottom lands. The included soil makes up about 10 percent of this map unit.

Permeability is moderate in the subsoil and moderately slow in the substratum. The available water capacity is moderate. The content of organic matter is moderately low. Surface runoff is very rapid. The surface layer is friable and is easily worked within a fairly wide range of moisture content.

This soil is generally not suited to cultivated crops, small grains, hay, or pasture because of steep slopes.

This soil is well suited to trees. Erosion is a moderate hazard, and the use of equipment is moderately limited. Plant competition is also moderate. Logging roads or trails should be placed on the contour where possible to help reduce erosion. The use of some equipment is restricted by slope. Competing vegetation can be controlled by cutting, spraying, or girdling.

This soil has severe limitations for use as building sites, septic tank absorption fields, and local roads and streets because of steep slope. It is generally not suited to these uses, and alternate sites should be selected.

This soil is in capability subclass VIIe and in woodland suitability subclass 1r.

MoC3—Miami clay loam, 6 to 12 percent slopes, severely eroded. This is a moderately sloping, deep, well drained soil on side slopes of knolls and nose slopes of drainageways. The areas are irregular or elongated in shape and range from 3 to 10 acres in size.

Typically, the surface layer is yellowish brown clay loam about 7 inches thick. The subsoil is yellowish brown, firm clay loam about 23 inches thick. The substratum to a depth of about 60 inches is pale brown loam that has free carbonates. In some of the most severely eroded areas, free carbonates are on the surface. In many undulating morainic areas the surface layer is silty clay loam. In other areas gravel and small cobblestones are on the surface. In a few small areas, a thin layer of gravelly sand material is between the subsoil and underlying loam till.

Included with this soil in mapping are small areas of Shoals soils in narrow drainageways. The included soil makes up about 10 percent of this map unit.

Permeability is moderate in the subsoil and moderately slow in the substratum. The available water capacity is

moderate. The content of organic matter is low. Surface runoff is rapid. The surface layer is plastic when wet and becomes cloddy and hard when dry. It is difficult to work. Root development is restricted below a depth of about 30 inches by compacted loamy glacial till.

In most areas this soil is used for cultivated crops. In a few small areas it is used as hayland or pasture. This soil is poorly suited to corn and soybeans. It is, however, suited to wheat. If this soil is used for cultivated crops, erosion is the main hazard. Tile outlet terraces, diversions, grassed waterways, or grade stabilization structures are needed to control surface runoff and erosion. Conservation tillage that leaves crop residue on the surface, contour tillage, crop rotation, cover crops, green manure crops, or the addition of other organic material helps improve the content of organic matter and tilth and thus reduces erosion.

This soil is suited to grasses and legumes for hay or pasture. Grasses and legumes effectively control erosion. Overgrazing causes compaction and poor tilth and reduces plant density and hardiness. Proper stocking rates, pasture rotation, timely grazing, and weed control help keep the pasture and soil in good condition.

This soil is well suited to trees. The hazards and limitations are generally slight. Plant competition, however, is moderate. Competing vegetation can be controlled by spraying, cutting, or girdling.

This soil has moderate limitations for use as building sites because of slope. Slope can be modified by grading, or buildings can be designed to fit the slope. Foundation drain tile should be used to remove excess water. This soil has severe limitations for septic tank absorption fields because of moderately slow permeability. It is generally not suited to this use. Lateral seepage on top of the till occurs in most systems, and effluent may travel several feet before surfacing. This soil has moderate limitations for local roads and streets because of slope and frost action. Drainage ditches along roads help reduce frost action.

This soil is in capability subclass IVe and in woodland suitability subclass 1o.

MoD3—Miami clay loam, 12 to 18 percent slopes, severely eroded. This is a strongly sloping, deep, well drained soil on back slopes, foot slopes, and nose slopes of ridges, knolls, and drainageways. The areas are irregular or elongated in shape and range from 3 to 10 acres in size.

Typically, the surface layer is dark yellowish brown clay loam about 5 inches thick. The subsoil is yellowish brown, firm clay loam about 19 inches thick. The substratum to a depth of about 60 inches is yellowish brown loam that has free carbonates. In some of the most severely eroded areas free carbonates are on the surface. In many undulating morainic areas the surface layer is silty clay loam. In other small places gravel and small cobbles are on the surface. Also, in small places a thin layer of gravelly sand material is between the subsoil and underlying loam till.

Included with this soil in mapping are small areas of Genesee and Shoals soils in narrow drainageways. The included soils make up about 10 percent of this map unit.

Permeability is moderate in the subsoil and moderately slow in the substratum. The available water capacity is moderate. The content of organic matter is low. Surface runoff is very rapid. The surface layer is plastic when wet and becomes cloddy and hard when dry. It is difficult to work. Root development is restricted below a depth of about 24 inches by compacted loamy glacial till.

In most areas this soil is used for pasture, or it is idle. In a few small areas it is used for cultivated crops.

This soil is poorly suited to corn, soybeans, and wheat. Erosion is the main hazard. Tile outlet terraces, diversions, grassed waterways, and grade stabilization structures are needed to control surface runoff and erosion. Contour farming, conservation tillage that leaves crop residue on the surface, crop rotation, cover crops, and green manure crops or the addition of other organic material help improve the content of organic matter and tilth and thus reduce erosion.

This soil is suited to grasses and legumes for hay or pasture. Grasses and legumes effectively control erosion. Overgrazing causes compaction and poor tilth and reduces plant density and hardiness. Proper stocking rates, pasture rotation, timely grazing, and weed control help keep the pasture and soil in good condition.

This soil is well suited to trees. The hazards and limitations are generally slight. Plant competition, however, is moderate. Competing vegetation can be controlled by spraying, cutting, or girdling.

This soil has severe limitations for use as building sites because of slope. Slope can be modified by grading, or buildings can be designed to fit the slope. Foundation drain tile should be used to remove excess water. This soil has severe limitations for septic tank absorption fields because of moderately slow permeability and slope. It is generally not suited to this use. Filter fields should be enlarged to accommodate reduced permeability. Slope can be modified by grading, and systems can be designed to operate properly on the slope. Lateral seepage on top of the till occurs in poorly designed systems, and effluent may travel several feet before surfacing. This soil also has severe limitations for local roads and streets because of slope. Slope can be modified by cutting and filling.

This soil is in capability subclass VIe and in woodland suitability subclass 1o.

Mp—Milford silty clay loam. This is a nearly level, deep, very poorly drained soil in depressions on broad lakebeds and plains. It is ponded by runoff from adjacent soils. The areas are irregular in shape and range from 10 to 200 acres in size.

Typically, the surface layer is very dark brown silty clay loam about 6 inches thick. The subsurface layer is very dark grayish brown silty clay loam about 5 inches thick.

The subsoil is about 37 inches thick. In the upper part it is very dark grayish brown, mottled very firm silty clay loam; in the middle part it is gray and dark gray very firm silty clay loam; and in the lower part it is gray mottled firm silty clay loam. The substratum to a depth of about 60 inches is gray stratified fine sandy loam and silty clay loam. In some small places the underlying material is stratified sand. In other places the dark colored surface layer is less than 10 inches thick, or the subsoil has less clay.

Included with this soil in mapping are small areas of Whitaker soils on small islandlike knolls in the landscape. The included soils make up about 3 percent of this map unit.

Permeability is moderately slow, and the available water capacity is high. The content of organic matter is high. Surface runoff is very slow. The water table is often near or above the surface in winter and early in spring. The surface layer is firm and is very difficult to till unless the soil is at the proper moisture content. If the soil is plowed or worked when wet, it forms large clods which become very firm when dry.

In most areas this soil is used for cultivated crops. In a few very small areas it is used for hayland or pasture.

This soil is suited to corn, soybeans, and wheat. Wetness is the major limitation. In most areas the soil has been artificially drained. Surface drains help remove excess surface water. Crop rotation, conservation tillage that leaves crop residue on the surface, green manure crops, or the addition of other organic material helps improve fertility and tilth and increases water infiltration.

This soil is suited to grasses and legumes for hay or pasture. Grasses and legumes should be selected on the basis of the extent of drainage. Overgrazing or grazing when the soil is wet causes compaction and poor tilth and reduces plant density and hardiness. Proper stocking rates, pasture rotation, timely grazing, and weed control help keep the pasture and soil in good condition.

This soil is suited to trees. However, because the soil formed under grass vegetation, few trees are presently growing on it.

This soil has severe limitations for use as building sites because of ponding. An adequate drainage system should be installed prior to construction. Buildings should be constructed without basements. This soil has severe limitations for septic tank absorption fields because of ponding and slow permeability. It is generally not suited to this use. This soil has severe limitations for local roads and streets because of frost action, low strength, and ponding. Elevating the roadbed and installing drainage ditches help lower the water table and reduce ponding and frost action. The road base should be strengthened with suitable material.

This soil is in capability subclass IIw. It is not assigned to a woodland suitability subclass.

Mu—Montgomery silty clay loam. This is a nearly level, deep, very poorly drained soil in slight depressions or swales on lake plains and slack water terraces. It is ponded by runoff from adjacent soils. The areas are irregular in shape and range from 5 to 40 acres in size.

Typically, the surface layer is very dark grayish brown silty clay loam about 5 inches thick. The subsurface layer is black silty clay loam about 7 inches thick. The subsoil is about 33 inches thick. In the upper part it is dark gray mottled firm silty clay; in the middle part it is grayish brown and gray mottled firm silty clay; and in the lower part it is gray mottled firm silty clay loam. The substratum to a depth of about 60 inches is mottled gray and light gray stratified silty clay loam and silty clay that has free carbonates. In some places the surface layer is grayish brown silt loam.

Included with this soil in mapping are small areas of somewhat poorly drained soils in slightly higher positions. The included soils make up about 5 percent of the map unit.

Permeability is very slow, and the available water capacity is high. The content of organic matter is high. Surface runoff is very slow. The water table is often near or above the surface in winter and early in spring. The surface layer is friable and is easily worked at the proper moisture content. However, it is sticky if worked when wet and forms large clods that become very firm when dry.

In most areas this soil is used for cultivated crops, hay, or pasture. In a few small areas it is used as woodland.

This soil is well suited to corn, soybeans, and small grain. In most areas it has been artificially drained. Land smoothing and shallow surface drains help remove excess surface water. Crop rotation, conservation tillage that leaves crop residue on the surface, cover crops, green manure crops, or the addition of other organic material helps improve fertility and increases water infiltration.

This soil is well suited to grasses and legumes for hay or pasture. Grasses and legumes should be selected on the basis of the extent of drainage. Overgrazing or grazing when the soil is wet causes compaction and poor tilth and reduces plant density and hardiness. Proper stocking rates, pasture rotation, timely grazing, and weed control help keep the pasture and soil in good condition.

This soil is suited to trees. However, the use of equipment is severely limited, seedling mortality is high, windthrow is a severe hazard, and plant competition is severe. Harvesting of trees is often delayed until the soil is dry or frozen. Some replanting of seedlings is usually necessary. Plant competition can be controlled by cutting, spraying, or girdling.

This soil has severe limitations for use as building sites because of ponding and shrink-swell potential. An adequate drainage system should be installed prior to construction. Buildings should be constructed without basements. Foundations and footings should be properly designed to help prevent structural damage from the

shrinking and swelling of the soil. This soil has severe limitations for septic tank absorption fields because of ponding and slow permeability. It is generally not suited to this use.

This soil has severe limitations for local roads and streets because of shrink-swell potential, low strength, and ponding. Drainage ditches should be installed along roads to prevent ponding. Elevating the roadbed also helps reduce the ponding. The road base should be strengthened with suitable material.

This soil is in capability subclass IIIw and in woodland suitability subclass 2w.

OcA—Ockley loam, 0 to 2 percent slopes. This is a nearly level, deep, well drained soil on broad outwash plains and high terraces. The areas are irregular in shape and range from 3 to 150 acres in size.

Typically, the surface layer is dark brown loam about 9 inches thick. The subsurface layer is dark yellowish brown loam about 4 inches thick. The subsoil is about 41 inches thick. In the upper part it is brown firm clay loam; in the part below that it is strong brown firm clay loam; in the part below that it is reddish brown firm gravelly clay loam; and in the lower part it is reddish brown friable sandy clay loam. The substratum to a depth of about 60 inches is yellowish brown gravelly sand and sand that has free carbonates. In some areas the lower part of the subsoil has less gravel and more sand. In some areas the surface layer and subsoil are neutral.

Included with this soil in mapping are small areas of Fox soils on very low knolls and Whitaker and Rensselaer soils in narrow drainageways. Fox soils have a thinner combined surface layer and subsoil. The included soils make up about 15 percent of this map unit.

Permeability is moderate, and the available water capacity is high. The content of organic matter is moderately low. Surface runoff is slow. The surface layer is friable and is easily worked within a wide range of moisture content.

In most areas this soil is used for cultivated crops. In a few small areas it is used for hay, pasture, or trees.

This soil is well suited to corn, soybeans, and wheat. Crop rotation, conservation tillage that leaves crop residue on the surface, cover crops, green manure crops, or the addition of other organic material helps improve fertility and maintain the content of organic matter and tilth.

This soil is well suited to grasses and legumes for hay or pasture. Overgrazing causes compaction and poor tilth and reduces plant density and hardiness. Proper stocking rates, pasture rotation, timely grazing, and weed control help keep the pasture and soil in good condition.

This soil is well suited to trees. The hazards and limitations are generally slight. Plant competition, however, is moderate. Competing vegetation can be controlled by spraying, cutting, or girdling.

This soil has moderate limitations for use as building sites because of shrink-swell potential. Foundations and footings should be properly designed to help prevent structural damage caused by shrinking and swelling of the soil. This soil has slight limitations for septic tank absorption fields. This soil has severe limitations for local roads and streets because of low strength. The road base should be strengthened with suitable material.

This soil is in capability class I and in woodland suitability subclass 1o.

OcB2—Ockley loam, 2 to 6 percent slopes, eroded. This is a gently sloping, deep, well drained soil on small moderately broad low knolls and shoulder slopes on outwash plains and high terraces. The areas are irregular or elongated in shape and range from 3 to 50 acres in size.

Typically, the surface layer is brown loam about 7 inches thick. The subsoil is about 46 inches thick. In the upper part it is yellowish brown, firm clay loam; in the middle part it is dark brown, firm clay loam and gravelly clay loam; and in the lower part it is yellowish red, friable loam. The substratum to a depth of about 60 inches is brownish yellow gravelly sand and sand that has free carbonates. In a few places the surface layer is fine sandy loam, and in other places the surface layer and subsoil have less gravel and more sand. In some areas the surface layer and subsoil are neutral.

Included with this soil in mapping are very small areas of Fox soils on the summit of knolls and on steep breaks adjacent to the bottom lands. The Fox soils have a thinner combined surface layer and subsoil. Also included are small areas where the surface layer is gravelly clay loam. Also included are areas where the surface layer is gravelly and has free carbonates. The included soils make up about 10 percent of this map unit.

Permeability is moderate. The available water capacity is high. The content of organic matter is moderately low. Surface runoff is medium. The surface layer is friable and is easily worked within a wide range of moisture content.

In most areas this soil is used for cultivated crops. In a few small areas it is used as hayland, pasture, or woodland.

This soil is suited to corn, soybeans, and small grain. Contour farming, tile outlet terraces, diversions, or grassed waterways are needed to control surface runoff and erosion. Conservation tillage that leaves crop residue on the surface, cover crops, and green manure crops or other organic material added to the soil help improve fertility and maintain the content of organic matter and tilth and thus help control erosion.

This soil is well suited to grasses and legumes for hay or pasture. Overgrazing causes compaction and poor tilth and reduces plant density and hardiness. Proper stocking rates, pasture rotation, timely grazing, and weed control help keep the pasture and soil in good condition.

This soil is well suited to trees. The hazards and limitations are generally slight. Plant competition,

however, is moderate. Competing vegetation can be controlled by spraying, cutting, or girdling.

This soil has moderate limitations for use as building sites because of the shrink-swell potential. Foundations and footings should be properly designed to help prevent structural damage caused by the shrinking and swelling of the soil. Foundation drain tile should be used to help remove excess water. This soil has slight limitations for septic tank absorption fields. This soil has severe limitations for local roads and streets because of low strength. The road base should be strengthened with suitable material.

This soil is in capability subclass IIe and in woodland suitability subclass 1o.

PkC2—Parke silt loam, 6 to 12 percent slopes, eroded. This is a moderately sloping, deep, well drained soil on shoulder slopes of dissected outwash plains and moraines. The areas are irregular in shape and range from 3 to 25 acres in size.

Typically, the surface layer is brown silt loam about 7 inches thick. The subsoil extends to a depth of 80 inches. In the upper part it is yellowish brown, firm silty clay loam; in the part below that it is strong brown, firm silty clay loam and clay loam; in the part below that it is yellowish red, firm sandy clay loam; and in the lower part it is red, firm sandy clay loam. In places the surface layer is silty clay loam.

Included with this soil in mapping are small areas of Hickory and Chetwynd soils that have slopes of more than 18 percent and Pike soils that have slopes of less than 6 percent. The included soils make up about 15 percent of this map unit.

Permeability is moderate, and the available water capacity is high. The content of organic matter is moderately low. Surface runoff is medium. The surface layer is friable and is easily worked within a fairly wide range of moisture content. It does, however, have a tendency to puddle and crust after hard rains, especially in areas where the surface soil is mixed with the subsoil.

In about half of the areas this soil is used for cultivated crops. In the other areas it is used as hayland, pasture, or woodland.

This soil is suited to corn, soybeans, and small grain. Contour farming, tile outlet terraces, diversions, or grassed waterways are needed to control surface runoff and reduce sheet erosion. Conservation tillage that leaves crop residue on the surface, cover crops, and green manure crops or other organic material added to the soil help improve fertility and tilth and help control erosion.

This soil is well suited to grasses and legumes for hay or pasture. Grasses and legumes effectively control erosion. Overgrazing causes compaction and poor tilth and reduces plant density and hardiness. Proper stocking rates, pasture rotation, timely grazing, and weed control help keep the pasture and soil in good condition.

This soil is well suited to trees. The hazards and limitations are generally slight. Plant competition, however, is moderate. Competing vegetation can be controlled by spraying, cutting, or girdling.

This soil has moderate limitations for use as building sites because of the shrink-swell potential and slope. Foundations, footings, and basement walls should be properly designed to help prevent structural damage caused by shrinking and swelling of the soil. Foundation drain tile should be used to help remove excess water. Buildings can be designed to fit the slope, or the slope can be modified by grading, or the filter field can be designed to operate properly on the slope. This soil has severe limitations for local roads and streets because of frost action and low strength. Drainage ditches along roads help prevent damage from frost action. The road base should be strengthened with suitable material.

This soil is in capability subclass IIIe and in woodland suitability subclass 1o.

PkD—Parke silt loam, 12 to 18 percent slopes. This is a strongly sloping, deep, well drained soil on ridgetops and shoulder slopes of dissected outwash plains and moraines. The areas are irregular in shape and range from 3 to 20 acres in size.

Typically, the surface layer is brown silt loam about 8 inches thick. The subsoil extends to a depth of 80 inches. In the upper part it is strong brown, firm silty clay loam; in the middle part it is yellowish red, firm sandy clay loam; and in the lower part it is red, firm sandy clay loam. In some places the surface layer and subsoil have more sand. In some places the surface layer is more clayey and has gravel.

Included with this soil in mapping are small areas of Hickory and Chetwynd soils that have slopes of more than 18 percent and Pike soils that have slopes of less than 6 percent. The included soils make up about 15 percent of this map unit.

Permeability is moderate, and the available water capacity is high. The content of organic matter is moderately low. Surface runoff is rapid. The surface layer is friable and is easily worked within a fairly wide range of moisture content. It does, however, have a tendency to puddle and crust after hard rains, especially in areas where the surface soil is mixed with the subsoil.

In most areas this soil is used for pasture or hay. In a few small areas it is used for cultivated crops or trees.

This soil is poorly suited to corn and soybeans. It is, however, suited to wheat. Erosion is the main hazard if this soil is used as cropland.

This soil is well suited to grasses and legumes for hay or pasture. Grasses and legumes effectively control erosion. Overgrazing causes compaction and poor tilth and reduces plant density and hardiness. Proper stocking rate, pasture rotation, timely grazing, and weed control help keep the pasture and soil in good condition.

This soil is well suited to trees. The hazards and limitations are generally slight. Plant competition, however, is moderate. Competing vegetation can be controlled by spraying, cutting, or girdling.

This soil has severe limitations for use as building sites because of slope. The slope can be modified by grading, or buildings can be designed to fit the slope. This soil has severe limitations for septic tank absorption fields because of slope. The slope can be modified by grading, or the filter field can be designed to operate properly on the slope. This soil has severe limitations for local roads and streets because of frost action, low strength, and slope. Drainage ditches along roads help prevent damage from frost action. The road base should be strengthened with suitable material. Cutting and filling can be used to modify slope.

This soil is in capability subclass IVe and in woodland suitability subclass 1o.

Pm—Patton silty clay loam. This is a nearly level, deep, poorly drained soil on broad glacial lakebeds. It is ponded by runoff from adjacent soils. The areas are irregular in shape and range from 10 to 400 acres in size.

Typically, the surface layer is very dark grayish brown and dark brown silty clay loam about 11 inches thick. The subsoil is about 39 inches thick. In the upper part it is gray, mottled, firm silty clay loam, and in the lower part it is grayish brown, mottled, firm silty clay loam. The substratum to a depth of about 60 inches is grayish brown, mottled, stratified silty clay loam and silt loam. In a few places the subsoil has more clay or more sand. In some places free carbonates are within 24 inches of the surface.

Included with this soil in mapping are small areas of Crosby and Whitaker soils in slightly higher positions. Also included are small areas of Wakeland and Wilbur soils in narrow drainageways. The included soils make up about 5 percent of this map unit.

Permeability is moderate, and the available water capacity is high. The content of organic matter is high. Surface runoff is slow. The water table is often near or above the surface in winter and early in spring. The surface layer is friable and is fairly easily worked at the proper moisture content. However, it is sticky if worked when wet and forms large clods that become very firm when dry.

In most areas this soil is used for cultivated crops. In a few small areas it is used as hayland, pasture, or woodland.

This soil is well suited to corn, soybeans, and wheat. Wetness is a major limitation. Additional drainage is needed in some areas. Surface drains help remove excess surface water. Crop rotations, conservation tillage that leaves crop residue on the surface, cover crops, and green manure crops or other organic material added to the soil help improve fertility and tilth and increase water infiltration.

This soil is suited to grasses and legumes for hay or pasture. Grasses and legumes should be selected on the basis of the extent of drainage. Overgrazing or grazing when the soil is wet causes compaction and poor tilth and reduces plant density and hardiness. Proper stocking rates, pasture rotation, timely grazing, and weed control help keep the pasture and soil in good condition.

This soil is suited to trees. However, the use of equipment is severely limited, plant competition is severe, seedling mortality is moderate, and windthrow is a moderate hazard. Harvesting and logging operations are often delayed until the soil is dry or frozen. Some replanting of seedlings is usually necessary. Competing vegetation can be controlled by cutting, spraying, or girdling.

This soil has severe limitations for use as building sites because of ponding. An adequate drainage system should be installed prior to construction. Buildings should be constructed without basements. This soil has severe limitations for septic tank absorption fields because of ponding and permeability. It is generally not suited to this use. This soil has severe limitations for local roads and streets because of ponding and low strength. Elevating the roadbed and installing drainage ditches help prevent ponding. The road base should be strengthened with suitable material.

This soil is in capability subclass IIw and in woodland suitability subclass 2w.

PnB—Pekin silt loam, 2 to 6 percent slopes. This is a gently sloping, deep, moderately well drained soil on breaks and slopes of shallow drainageways on low terraces. It is rarely flooded. The areas are irregular in shape and range from 3 to 10 acres in size.

Typically, the surface layer is brown silt loam about 4 inches thick. The subsurface layer is yellowish brown silt loam about 4 inches thick. The subsoil is about 48 inches thick. In the upper part it is yellowish brown, friable silt loam; in the middle part it is yellowish brown, mottled, firm silty clay loam; and in the lower part it is light brownish gray, mottled, firm and brittle silty clay loam. The substratum to a depth of about 60 inches is light brownish gray, mottled, stratified silt loam and silty clay loam.

Included with this soil in mapping are small areas of Elkinsville soils that have slopes of more than 6 percent and Banlic and Bartle soils that have slopes of less than 2 percent. The included soils make up about 10 percent of the map unit.

Permeability is moderate in the upper part of the subsoil and very slow in the lower part of the subsoil. The available water capacity is moderate. The content of organic matter is moderately low. Surface runoff is medium. The water table is often at a depth of 2 to 6 feet in winter and early in spring. The surface layer is friable and is easily worked within a fairly wide range of moisture content. It does, however, have a tendency to puddle and crust after hard rains. Root development is restricted below a depth of about 21 inches by a fragipan.

In about half the areas this soil is used for cultivated crops. In the other areas it is used as hayland, pasture, or woodland.

This soil is suited to corn, soybeans, and wheat. The fragipan restricts root development of some plants and causes moisture stress during extended dry periods. Contour farming, tile outlet terraces, diversions, or grassed waterways are needed to control surface runoff and reduce erosion. Conservation tillage that leaves crop residue on the surface, crop rotation, cover crops, and green manure crops or other organic material added to the soil help improve the content of organic matter and tilth. They also help reduce crusting and erosion.

This soil is well suited to grasses and legumes for hay or pasture. The selection of legumes and grasses should be based on tolerance to frost heave and restricted rooting depth. Overgrazing or grazing when the soil is wet causes compaction and poor tilth and reduces plant density and hardiness. Proper stocking rates, pasture rotation, timely grazing, and weed control help keep the pasture and soil in good condition.

This soil is suited to trees. The hazards and limitations are slight. Tree seeds, cuttings, and seedlings survive and grow moderately well if competing vegetation is controlled by site preparation or by spraying, cutting, or girdling.

This soil has severe limitations for use as building sites because of wetness and flooding. It has severe limitations for septic tank absorption fields because of wetness and slow permeability. The soil is generally not suited to these uses. This soil has severe limitations for local roads and streets because of frost action. Drainage ditches along roads help reduce frost action.

This soil is in capability subclass IIe and in woodland suitability subclass 3o.

PpA—Pike silt loam, 0 to 2 percent slopes. This is a nearly level, deep, well drained soil on flat ridgetops of dissected outwash plains and moraines. The areas are irregular in shape and range from 3 to 80 acres in size.

Typically, the surface layer is brown silt loam about 8 inches thick. The subsurface layer is brown silt loam about 5 inches thick. The subsoil is about 61 inches thick. In the upper part it is strong brown, firm silty clay loam; in the part below that it is brown, firm silt loam; in the part below that it is brown, firm loam; and in the lower part it is reddish brown and brown stratified clay loam and sandy clay loam. The substratum to a depth of 80 inches is red stratified clay loam and sandy clay loam. In places stratified loamy sand, sand, and gravelly sand are below a depth of 9 feet. In some places the lower part of the subsoil has more sand or clay. In other places the silt cap is thinner or thicker.

Included with this soil in mapping are small areas of Chetwynd soils on steep slopes and Taggart soils in low swales. The included soils make up about 10 percent of the map unit.

Permeability is moderate, and the available water capacity is high. The content of organic matter is moderately low. Surface runoff is slow. The surface layer is friable and is easily worked within a fairly wide range of moisture content. It does, however, have a tendency to puddle and crust after hard rains.

In most areas this soil is used for cultivated crops. In a few small areas it is used as hayland, pasture, or woodland.

This soil is well suited to corn, soybeans, and small grain. Crop rotation, conservation tillage that leaves crop residue on the surface, cover crops, and green manure crops or other organic material added to the soil help reduce puddling and crusting and increase water infiltration.

This soil is well suited to grasses and legumes for hay or pasture. Overgrazing causes compaction and poor tilth and reduces plant density and hardiness. Proper stocking rates, pasture rotation, timely grazing, and weed control help keep the pasture and soil in good condition.

This soil is well suited to trees. Management concerns are generally slight. Plant competition, however, is moderate. Competing vegetation can be controlled by spraying, cutting, or girdling.

This soil has slight limitations for use as building sites. It has slight limitations for septic tank absorption fields. This soil has severe limitations for local roads and streets because of frost action and low strength. Drainage ditches along roads help reduce frost action. The road base should be strengthened with suitable material.

This soil is in capability class I and in woodland suitability subclass 1o.

PpB2—Pike silt loam, 2 to 6 percent slopes, eroded. This is a gently sloping, deep, well drained soil on low knolls and shoulder slopes of dissected outwash plains and moraines. The areas are irregular in shape and range from 3 to 40 acres in size.

Typically, the surface layer is dark yellowish brown silt loam about 8 inches thick. The subsoil is about 48 inches thick. In the upper part it is yellowish brown, firm silty clay loam; in the middle part it is dark yellowish brown, firm silty clay loam; and in the lower part it is yellowish brown, firm silt loam. The substratum to a depth of about 70 inches is mottled yellowish red, pink, and dark brown clay loam. In some places the subsoil is thinner and has more sand.

Included with this soil in mapping are small areas of Parke soils that have slopes of 6 to 12 percent. Also included are very small areas of Hickory and Chetwynd soils that have steep slopes and small areas where the soils have a surface layer of silty clay loam. The included soils make up about 15 percent of this map unit.

Permeability is moderate, and the available water capacity is high. The content of organic matter is moderately low. Surface runoff is medium. The surface layer is friable and is easily worked within a fairly wide range of moisture content. It does, however, have a tendency to puddle and crust after hard rains, especially in areas where the surface soil is mixed with subsoil.

In most areas this soil is used for cultivated crops. In a few small areas it is used as hayland, pasture, or woodland.

This soil is suited to corn, soybeans, and small grain. Contour farming, tile outlet terraces, diversions, or grassed waterways are needed to control surface runoff and erosion. Crop rotation, conservation tillage that leaves crop residue on the surface, cover crops, and green manure crops or other organic material added to the soil help improve fertility and tilth and increase water infiltration and thus help control erosion.

This soil is well suited to grasses and legumes for hay or pasture. Overgrazing causes compaction and poor tilth and reduces plant density and hardiness. Proper stocking rates, pasture rotation, timely grazing, and weed control help keep the pasture and soil in good condition.

This soil is well suited to trees. The hazards and limitations are generally slight. Plant competition, however, is moderate. Competing vegetation can be controlled by spraying, cutting, or girdling.

This soil has slight limitations for use as building sites. It has slight limitations for septic tank absorption fields. This soil has severe limitations for local roads and streets because of frost action and low strength. Drainage ditches along roads help reduce frost action. The road base should be strengthened with suitable material.

This soil is in capability subclass IIe and in woodland suitability subclass 1o.

PrA—Princeton fine sandy loam, 0 to 2 percent slopes. This is a nearly level, deep, well drained soil on ridgetops, knoll tops, and toe slopes. The areas are irregular or elongated in shape and range from 3 to 30 acres in size.

Typically, the surface layer is brown fine sandy loam about 8 inches thick. The subsoil is about 47 inches thick. In the upper part it is yellowish brown, friable fine sandy loam; in the middle part it is yellowish brown, firm sandy clay loam; and in the lower part it is yellowish brown, friable sandy loam. The substratum to a depth of about 60 inches is yellowish brown fine sand that has free carbonates. In some small places the surface layer and subsoil have more silt.

Included with this soil in mapping are small areas of somewhat poorly drained soils on ridgetops and small areas of Bloomfield soils on knolls. The included soils make up 15 percent of this map unit.

Permeability is moderate in the subsoil and moderately rapid in the substratum. The available water capacity is moderate. The content of organic matter is moderately low. Surface runoff is slow. The surface layer is friable and is easily worked within a wide range of moisture content.

In most areas this soil is used for cultivated crops. In a few small areas it is used as hayland, pasture, or woodland.

This soil is well suited to corn, soybeans, and wheat. When rainfall is below normal or poorly distributed, crops are subject to damage from drought. Conservation tillage that leaves crop residue on the surface, crop rotation, cover crops, and green manure crops or other organic material added to the soil help improve the content of organic matter and tilth.

This soil is well suited to grasses and legumes for hay or pasture. Overgrazing causes compaction and poor tilth and reduces plant density and hardiness. Proper stocking rates, pasture rotation, timely grazing, and weed control help keep the pasture and soil in good condition.

This soil is well suited to trees. The hazards and limitations are generally slight. Plant competition, however, is moderate. Competing vegetation can be controlled by spraying, cutting, or girdling.

This soil has slight limitations for use as building sites and septic tank absorption fields.

This soil has moderate limitations for local roads and streets because of frost action. Drainage ditches along roads and streets help prevent damage from frost action.

This soil is in capability subclass IIs and in woodland suitability subclass 1o.

PrB—Princeton fine sandy loam, 2 to 6 percent slopes. This is a gently sloping, deep, well drained soil on shoulder slopes and toe slopes. The areas are irregular in shape and range from 5 to 50 acres in size.

Typically, the surface layer is brown fine sandy loam about 6 inches thick. The subsurface layer is yellowish brown sandy loam about 4 inches thick. The subsoil is about 43 inches thick. In the upper part it is yellowish brown, firm sandy clay loam, and in the lower part it is yellowish brown, friable sandy loam. The substratum to a depth of about 60 inches is yellowish brown stratified fine sand and loamy sand that has free carbonates. In some places the surface layer is light yellowish brown. In some places the surface layer and subsoil have more silt.

Included with this soil in mapping are small areas of somewhat poorly drained soils in depressions or narrow drainageways and Bloomfield soils on small knolls. The included soils make up about 15 percent of this map unit.

Permeability is moderate in the subsoil and moderately rapid in the substratum. The available water capacity is moderate. The content of organic matter is moderately low. Surface runoff is medium. The surface layer is friable and is easily worked within a wide range of moisture content.

In most areas this soil is used for cultivated crops. In a few small areas it is used as hayland, pasture, or woodland.

This soil is suited to corn and soybeans. It is well suited to wheat. Erosion is the major hazard. When rainfall is below normal or is poorly distributed, droughtiness is also a limitation. Tile outlet terraces, contour farming, diversions, grassed waterways, or grade stabilization structures are needed to control surface runoff and prevent erosion. Conservation tillage that

leaves crop residue on the surface, crop rotation, cover crops, and green manure crops or other organic material added to the soil help improve and maintain the content of organic matter and tilth and help control erosion.

This soil is well suited to grasses and legumes for hay or pasture. Grasses and legumes effectively control erosion. Overgrazing causes compaction and poor tilth and reduces plant density and hardiness. Proper stocking rates, pasture rotation, timely grazing, and weed control help keep the pasture and soil in good condition.

This soil is well suited to trees. The hazards and limitations are generally slight. Plant competition, however, is moderate. Competing vegetation can be controlled by spraying, cutting, or girdling.

This soil has slight limitations for use as building sites and septic tank absorption fields. This soil has moderate limitations for local roads and streets because of frost action. Drainage ditches along roads and streets help prevent damage from frost action.

This soil is in capability subclass IIe and in woodland suitability subclass 1o.

PrC—Princeton fine sandy loam, 6 to 12 percent slopes. This is a moderately sloping, deep, well drained soil on side slopes of knolls, knobs, and drainageways. The areas are irregular in shape and range from 5 to 100 acres in size.

Typically, the surface layer is brown fine sandy loam about 6 inches thick. The subsurface layer is yellowish brown fine sandy loam about 4 inches thick. The subsoil is about 44 inches thick. In the upper part it is yellowish brown, firm fine sandy loam; in the middle part it is brown and strong brown, firm sandy clay loam; and in the lower part it is dark brown, friable sandy loam. The substratum to a depth of about 60 inches is yellowish brown loamy fine sand. In some places the surface layer is light yellowish brown. In other places the surface layer and subsoil have more silt.

Included with this soil in mapping are Bloomfield soils on small knolls and on toe slopes. The included soils make up about 15 percent of this map unit.

Permeability is moderate in the subsoil and moderately rapid in the substratum. The available water capacity is moderate. The content of organic matter is moderately low. Surface runoff is medium. The surface layer is friable and is easily worked within a wide range of moisture content.

In about half of the areas this soil is used for cultivated crops. In the other areas it is used as hayland, pasture, or woodland.

This soil is suited to corn, soybeans, and wheat. Erosion is the major hazard. When rainfall is below normal or is poorly distributed, droughtiness is also a limitation. Tile outlet terraces, contour farming, diversions, grassed waterways, or grade stabilization structures are needed to control surface runoff and prevent erosion. Conservation tillage that leaves crop residue on the surface, crop rotation, cover crops, and green manure crops or other organic material added to the soil help improve and maintain the content of organic matter and tilth. They also help control erosion.

This soil is suited to grasses and legumes for hay or pasture. Grasses and legumes effectively control erosion. Overgrazing causes compaction and poor tilth and reduces plant density and hardiness. Proper stocking rates, pasture rotation, timely grazing, and weed control help keep the pasture and soil in good condition.

This soil is well suited to trees. Management concerns are generally slight. Plant competition, however, is moderate. Competing vegetation can be controlled by spraying, cutting, or girdling.

This soil has moderate limitations for use as building sites because of slope. The slope can be modified by grading, or buildings can be designed to fit the slope. This soil has moderate limitations for septic tank absorption fields because of slope. The slope can be modified by grading, or absorption field systems can be designed to operate properly on the slope. This soil has moderate limitations for local roads and streets because of frost action and slope. Drainage ditches along roads and streets to help prevent damage from frost action.

This soil is in capability subclass IIIe and in woodland suitability subclass 1o.

PrD—Princeton fine sandy loam, 12 to 18 percent slopes. This is a strongly sloping, deep, well drained soil on back slopes and foot slopes. The areas are irregular in shape and range from 5 to 60 acres in size.

Typically, the surface layer is brown fine sandy loam about 6 inches thick. The subsurface layer is dark yellowish brown fine sandy loam about 5 inches thick. The subsoil is about 42 inches thick. In the upper part it is yellowish brown, firm sandy clay loam; in the part below that it is yellowish red, firm sandy clay loam; in the part below that it is strong brown very friable loamy fine sand; and in the lower part it is yellowish brown loamy fine sand that has thin bands of fine sandy loam. The substratum to a depth of about 60 inches is light yellowish brown fine sand that has thin bands of fine sandy loam.

Included with this soil in mapping are small areas of Bloomfield soils in hummocky areas and somewhat poorly drained soils in depressions and small narrow drainageways. The included soils make up about 15 percent of this map unit.

Permeability is moderate in the subsoil and moderately rapid in the substratum. The available water capacity is moderate. The content of organic matter is moderately low. Surface runoff is rapid. The surface layer is friable and is easily worked within a wide range of moisture content.

In most areas this soil is used as hayland, pasture, or woodland.

This soil is poorly suited to corn and soybeans. It is, however, suited to wheat. Erosion is the major hazard. If rainfall is below normal or is poorly distributed, droughtiness is a limitation.

This soil is well suited to grasses and legumes for hay or pasture. Overgrazing causes compaction and poor tilth and reduces plant density and hardiness. Proper stocking rates, pasture rotation, timely grazing, and weed control help keep the pasture and soil in good condition.

This soil is well suited to trees. The hazards and limitations are generally slight. Plant competition, however, is moderate. Competing vegetation can be controlled by spraying, cutting, or girdling.

This soil has severe limitations for use as building sites because of slope. The slope can be modified by grading, or buildings can be designed to fit the slope. This soil has severe limitations for septic tank absorption fields because of slope. The slope can be modified by grading, or systems can be designed to fit the slope. Lateral seepage occurs in a poorly designed system, and effluent may surface or contaminate nearby shallow wells. This soil has severe limitations for local roads and streets because of slope. Cutting and filling help overcome this limitation.

This soil is in capability subclass IVe and in woodland suitability subclass 1o.

PrE—Princeton fine sandy loam, 18 to 25 percent slopes. This is a moderately steep, deep, well drained soil on hummocky areas on narrow to moderately broad ridgetops. The areas are irregular in shape and range from 5 to 20 acres in size.

Typically, the surface layer is dark grayish brown fine sandy loam about 3 inches thick. The subsurface layer is yellowish brown friable sandy loam about 5 inches thick. The subsoil is about 38 inches thick. In the upper part it is yellowish brown, friable fine sandy loam; in the middle part it is brown, friable sandy clay loam; and in the lower part it is brown, friable sandy loam. The substratum to a depth of about 60 inches is yellowish brown sandy loam that has thick lenses of fine sand that has free carbonates. In a few places the subsoil has more silt. In some places the surface layer is darker than the typical color.

Included with this soil in mapping are small areas of Bloomfield soils on knolls or toe slopes and very poorly drained soils in weakly defined drainageways. The included soils make up about 20 percent of this map unit.

Permeability is moderate in the subsoil and moderately rapid in the substratum. The available water capacity is moderate. The content of organic matter is moderately low. Surface runoff is rapid. The surface layer is friable and is easily worked within a wide range of moisture content.

In most areas this soil is used as woodland, hayland, or pasture. In a few very small areas it is used for cultivated crops.

This soil is generally not suited to corn, soybeans, and wheat. Slope and the hazard of erosion are limitations.

This soil is poorly suited to grasses and legumes for hay or pasture because of slope. Overgrazing causes compaction and poor tilth and reduces plant density and hardiness. Proper stocking rates, pasture rotation, timely grazing, and weed control help keep the pasture and soil in good condition.

This soil is well suited to trees. The use of equipment is moderately limited, erosion is a moderate hazard, and plant competition is also moderate. The moderately steep slopes may restrict the use of some logging equipment. Roads should be constructed on the contour where possible to help reduce erosion. Competing vegetation can be controlled by cutting, spraying, and girdling.

This soil has severe limitations for use as building sites, septic tank absorption fields, and local roads and streets because of slope. It is generally not suited to these uses, and alternate sites should be selected.

This soil is in capability subclass VIe and in woodland suitability subclass 1r.

Ps—Pits. This map unit is mostly on the broad level terraces and bottom lands along the White River and its tributaries. It consists of sand and gravel pits, clay pits, borrow pits, and stone quarries. The areas are irregular in shape and range from 3 to more than 150 acres in size. Sand and gravel have been removed to a depth below the water table in many areas, and the resulting pits have filled with water. The sides of some of these pits support cover which provides habitat for wildlife. The clay pits, borrow pits, and stone quarries are essentially bare and offer little cover for wildlife. The water in the sand and gravel pits, if properly stocked, can be used for fishing.

This map unit is in capability subclass VIIIe.

Rd—Reesville silt loam. This is a nearly level, deep, somewhat poorly drained soil on knolls on lake plains and outwash plains. The areas are irregular in shape and range from 3 to 20 acres in size.

Typically, the surface layer is dark grayish brown silt loam about 7 inches thick. The subsurface layer is grayish brown silt loam about 4 inches thick. The subsoil is about 45 inches thick. In the upper part it is yellowish brown mottled, firm silty clay loam; in the middle part it is light brownish gray and dark grayish brown mottled, firm silty clay loam; and in the lower part it is yellowish brown mottled, firm silt loam. The substratum to a depth of about 60 inches is yellowish brown mottled silt loam that has free carbonates. In some places the surface layer is gray, light brownish gray, or brown. In other places the surface layer and the subsoil have more sand.

Included with this soil in mapping are small areas of Patton and Rensselaer soils in slightly lower positions. The included soils make up about 5 percent of this map unit.

Permeability is moderately slow. The available water capacity is high. The content of organic matter is moderate. Surface runoff is slow. The water table is often at a depth of 1 to 2 feet in winter and early in

spring. The surface layer is friable and is easily worked within a fairly wide range of moisture content. It does, however, have a tendency to puddle and crust after hard rains.

In most areas this soil is used for cultivated crops. In a few small areas it is used as hayland, pasture, or woodland.

This soil is well suited to corn, soybeans, and wheat. Wetness is the major limitation. In most areas the soil has been artificially drained. Surface drains help remove excess surface water. Crop rotation, conservation tillage that leaves crop residue on the surface, cover crops, and green manure crops or other organic material added to the soil help improve fertility and tilth and increase water infiltration.

This soil is well suited to grasses and legumes for hay or pasture. Grasses and legumes should be selected on the basis of the extent of drainage. Overgrazing or grazing when the soil is wet causes compaction and poor tilth and reduces plant density and hardiness. Proper stocking rates, pasture rotation, timely grazing, and weed control help keep the pasture and soil in good condition.

This soil is suited to trees. The hazards and limitations are generally slight. Plant competition, however, is moderate. Competing vegetation can be controlled by cutting, spraying, or girdling.

This soil has severe limitations for use as building sites because of wetness. An adequate drainage system helps overcome this limitation. This soil has severe limitations for septic tank absorption fields because of wetness and the moderately slow permeability. Commercial sewers and treatment plants are generally needed. This soil has severe limitations for local roads and streets because of frost action and low strength. Drainage measures that lower the water table help reduce frost action. The road base should be strengthened with suitable material.

This soil is in capability subclass IIw and in woodland suitability subclass 2o.

Re—Rensselaer clay loam. This is a nearly level, deep, very poorly drained soil on broad outwash plains and lakebeds. It is ponded by runoff from adjacent soils. The areas are irregular in shape and range from 20 to 300 acres in size.

Typically, the surface layer is very dark gray clay loam about 9 inches thick. The subsurface layer is very dark grayish brown clay loam about 9 inches thick. The subsoil is about 29 inches thick. In the upper part it is dark gray mottled, firm clay loam; in the middle part it is grayish brown mottled, firm clay loam; and in the lower part it is gray mottled, firm clay loam. The substratum to a depth of about 60 inches is gray mottled stratified clay loam, loamy sand, and sand that has free carbonates. In some places the surface layer is sandy loam. In some places the subsoil is more clayey, and in other places it is gravelly.

Included with this soil in mapping are small areas of Whitaker, Martinsville, and Miami soils. The Whitaker soils are on slight rises. The Martinsville and Miami soils are at the edge of sluiceways. The included soils make up about 10 percent of this map unit.

Permeability is slow, and the available water capacity is high. The content of organic matter is high. Surface runoff is very slow. The water table is often near or above the surface in winter and early in spring. The surface layer is friable and is easily worked at the proper moisture content. However, it is sticky if worked when wet and forms large clods that become very hard when dry.

In most areas this soil is used for cultivated crops. In a few small areas it is used as hayland or pasture. In most areas the soil has been drained by subsurface drains and open ditches. This soil is well suited to corn, soybeans, and wheat. Wetness is the major limitation. Surface drains help remove excess surface water. Crop rotation, conservation tillage that leaves crop residue on the surface, cover crops, and green manure crops or other organic material added to the soil help improve fertility and increase water infiltration.

This soil is suited to grasses and legumes for hay or pasture. Grasses and legumes should be selected on the basis of the extent of drainage. Overgrazing or grazing when the soil is wet causes compaction and poor tilth and reduces plant density and hardiness. Proper stocking rates, pasture rotation, timely grazing, and weed control help keep the pasture and soil in good condition.

This soil is suited to trees. However, the use of equipment is severely limited, seedling mortality is high, windthrow is a severe hazard, and plant competition is also severe. Harvesting of trees is often delayed until the soil is dry or frozen. Some replanting of seedlings is usually necessary. Plant competition can be controlled by cutting, spraying, or girdling.

This soil has severe limitations for use as building sites because of ponding. An adequate drainage system should be installed prior to construction. Buildings should be constructed without basements. Foundations and footings should be properly designed to help prevent structural damage by shrinking and swelling of the soil. Foundation drain tile should be used to help remove excess water. This soil has severe limitations for septic tank absorption fields because of ponding and slow permeability. It is generally not suited to this use. This soil has severe limitations for local roads and streets because of frost action, low strength, and ponding. Drainage ditches along roads help reduce frost action. The road base should be strengthened with suitable material. Elevating the roadbed helps reduce ponding.

This soil is in capability subclass IIw and in woodland suitability subclass 2w.

Ro—Ross loam. This is a nearly level, deep, well drained soil on broad flood plains and low terraces. It is occasionally flooded. The areas are irregular in shape and range from 10 to 200 acres in size.

Typically, the surface layer is dark brown loam about 9 inches thick. The subsurface layer is dark brown silt loam about 11 inches thick. The subsoil is dark brown firm loam about 10 inches thick. The underlying material to a depth of about 60 inches is dark grayish brown loam. In a few places the surface layer is clay loam.

Included with this soil in mapping are small areas of Genesee and Stonelick soils. Also included are small areas of well drained soils that have a surface layer and subsoil of dark colored sandy loam and loamy sand and small areas of soils that have gravel throughout the surface layer and subsoil. The included soils make up about 10 percent of this map unit.

Permeability is moderate, and the available water capacity is high. The content of organic matter is high. Surface runoff is slow. The water table is at a depth of 4 to 6 feet in winter and early in spring. The surface layer is friable and is easily worked within a wide range of moisture content.

In most areas this soil is used for cultivated crops. In a few small areas it is used as hayland or pasture.

This soil is well suited to corn, soybeans, and wheat. Occasional flooding is the only hazard. Crop rotation, conservation tillage that leaves crop residue on the surface, cover crops, and green manure crops or the addition of other organic material help improve fertility and tilth and increase water infiltration.

This soil is well suited to grasses and legumes for hay or pasture. Occasional flooding may damage these crops. Overgrazing causes compaction and poor tilth and reduces plant density and hardiness. Proper stocking rates, pasture rotation, timely grazing, and weed control help keep the pasture and soil in good condition.

This soil is well suited to trees. The hazards and limitations are generally slight. Plant competition, however, is moderate. Competing vegetation can be controlled by spraying, cutting, or girdling.

This soil has severe limitations for use as building sites, septic tank absorption fields, and local roads and streets because of flooding. It is generally not suited to these uses, and alternate sites should be selected.

This soil is in capability subclass IIw and in woodland suitability subclass 1o.

RuB—Russell silt loam, 2 to 6 percent slopes. This is a gently sloping, deep, well drained soil on knoll tops and side slopes on glacial moraines. The areas are irregular in shape and range from 3 to 30 areas in size.

Typically, the surface layer is dark grayish brown silt loam about 8 inches thick. The subsoil is about 51 inches. In the upper part it is yellowish brown, firm silt loam; in the part below that it is dark yellowish brown firm silty clay loam; in the part below that it is yellowish brown firm clay loam; and in the lower part it is yellowish brown firm loam. The substratum to a depth of 65 inches is brown loam that has free carbonates. In some small places the upper part of the subsoil has been mixed with the surface soil by plowing, and the surface layer is yellowish brown or dark yellowish brown silty clay loam. Also in some places the lower part of the subsoil has a high content of sand, or thin layers of loamy sand and gravelly sand are between the subsoil and glacial till.

Included with this soil in mapping are small areas of Brookston, Crosby, and Fincastle soils in narrow drainageways and shallow depressions. The included soils make up about 10 percent of this map unit.

Permeability is moderate in the subsoil and moderately slow in the substratum. The available water capacity is high. The content of organic matter is moderately low. Surface runoff is medium. The surface layer is friable and is easily worked within a fairly wide range of moisture content. It does, however, have a tendency to puddle and crust after hard rains, especially in areas where the surface soil is mixed with subsoil.

In about half the areas this soil is used for cultivated crops. In the other areas it is used as hayland, pasture, or woodland.

This soil is suited to corn, soybeans, and wheat. If the soil is used for cultivated crops, erosion is a hazard. Tile outlet terraces, diversions, grassed waterways, or grade stabilization structures are needed to control surface runoff and erosion. Conservation tillage that leaves crop residue on the surface, contour farming, crop rotation, cover crops, and green manure crops or other organic material added to the soil help improve the content of organic matter and tilth and thus reduce crusting and erosion.

This soil is well suited to grasses and legumes for hay or pasture. Grasses and legumes effectively control erosion. Overgrazing causes compaction and poor tilth and reduces plant density and hardiness. Proper stocking rates, pasture rotation, timely grazing, and weed control help keep the pasture and soil in good condition.

This soil is well suited to trees. The hazards and limitations are generally slight. Plant competition, however, is moderate. Competing vegetation can be controlled by spraying, cutting, or girdling.

This soil has moderate limitations for use as building sites. Foundations, footings, and basement walls should be properly designed to help prevent structural damage caused by shrinking and swelling of the soil. Foundation drain tile should be used to help remove excess water. This soil has moderate limitations for septic tank absorption fields because of permeability. Filter fields should be enlarged to help overcome this limitation. Lateral seepage on top of the till occurs in a poorly designed system, and effluent may travel several feet before surfacing. This soil has severe limitations for local roads and streets because of frost action and low strength. Drainage ditches along roads help prevent damage from frost action. The road base should be strengthened with suitable material.

This soil is in capability subclass IIe and in woodland suitability subclass 1o.

Sh—Shoals silt loam. This is a nearly level, deep, somewhat poorly drained soil on narrow to broad flood plains. It is frequently flooded. The areas are elongated or irregular in shape and range from 3 to 80 acres in size.

Typically, the surface layer is dark grayish brown silt loam about 8 inches thick. The substratum extends to a depth of about 60 inches. In the upper part it is dark grayish brown mottled silt loam; in the middle part it is brown and yellowish brown mottled loam; and in the lower part it is light brownish gray mottled loam. In a few places the surface layer is darker than the typical color. In other places a thin smear of sand is on the surface.

Included with this soil in mapping are small areas of slightly higher lying Genesee soils. Also included are small areas of Sloan soils in oxbows or swales. The included soils make up about 10 percent of this map unit.

Permeability is moderate, and the available water capacity is high. The content of organic matter is moderately low. Surface runoff is very slow. The water table is often at a depth of 1 to 3 feet in winter and early in spring. The surface layer is friable and is easily worked within a fairly wide range of moisture content. It does, however, have a tendency to puddle and crust after hard rains.

In about half of the areas this soil is used for cultivated crops. In the other areas it is used as hayland, pasture, or woodland.

This soil is suited to corn and soybeans. However, it is poorly suited to wheat. Wetness is the major limitation. Flooding is a hazard in most years. In some areas the soil has been artificially drained. Crop rotation, conservation tillage that leaves crop residue on the surface, cover crops, and green manure crops or other organic material added to the soil help improve fertility and tilth and increase water infiltration.

This soil is suited to grasses and legumes for hay or pasture. Grasses and legumes should be selected on the basis of the extent of drainage. Overgrazing or grazing when the soil is wet causes compaction and poor tilth and reduces plant density and hardiness. Proper stocking rates, pasture rotation, timely grazing, and weed control help keep the pasture and soil in good condition.

This soil is well suited to trees. The hazards and limitations are generally slight. Plant competition, however, is moderate. Competing vegetation can be controlled by spraying, cutting, or girdling.

This soil has severe limitations for use as building sites, septic tank absorption fields, and local roads and streets because of flooding. Wetness is an additional severe limitation for building sites and septic tank absorption fields. Frost action is an additional severe limitation for roads and streets. The soil is generally not suited to these uses, and alternate sites should be selected.

This soil is in capability subclass IIw and in woodland suitability subclass 2o.

Sn—Sloan silty clay loam. This is a nearly level, deep, very poorly drained soil in oxbows and depressions on flood plains. It is frequently flooded. The areas are irregular in shape and range from 3 to 40 acres in size.

Typically, the surface layer is very dark grayish brown silty clay loam about 9 inches thick. The subsurface layer is very dark grayish brown silty clay loam about 9 inches thick. The subsoil is about 39 inches thick. In the upper part it is dark gray mottled, firm silty clay loam; in the middle part it is gray mottled, firm silty clay loam; and in the lower part it is gray mottled, firm clay loam. The substratum to a depth of about 60 inches is grayish brown and dark grayish brown stratified sand and sandy loam. In some places the surface layer is grayish brown.

Included with this soil in mapping are small areas of Shoals soils in slightly higher positions. The included soils make up about 10 percent of this map unit.

Permeability is moderately slow, and the available water capacity is high. The content of organic matter is high. Surface runoff is very slow. The water table is often at or near the surface in winter and early in spring. The surface layer is friable and is easily worked at the proper moisture content. However, it is sticky if worked when wet and forms large clods that become very firm when dry.

In most areas this soil is used as hayland or pasture. In a few small areas it is used for cultivated crops or as woodland.

This soil is poorly suited to corn, soybeans, and small grain. Wetness is the major limitation. Flooding is a hazard in most years. In most areas the soil has not been artificially drained. Surface and subsurface drainage are needed if crops are grown. Conservation tillage that leaves crop residue on the surface, crop rotation, cover crops, and green manure crops or other organic material added to the soil help improve fertility and tilth and increase water infiltration in areas where the soil has been drained.

This soil is poorly suited to grasses and legumes for hay or pasture. Grasses and legumes should be selected on the basis of the extent of drainage. Overgrazing or grazing when the soil is wet causes compaction and poor tilth and reduces plant density and hardiness. Proper stocking rates, pasture rotation, timely grazing, and cutting of weeds at proper time and height help keep the pasture and soil in good condition.

The soil is suited to trees. However, the use of equipment is severely limited, seedling mortality is high, windthrow is a severe hazard, and plant competition is severe. Harvesting of trees is often delayed until the soil is dry or frozen. Some replanting of seedlings is usually necessary. Plant competition can be controlled by cutting, spraying, or girdling.

This soil has severe limitations for use as building sites, septic tank absorption fields, and local roads and streets because of frequent flooding. Wetness and low strength are severe limitations for local roads and

streets. Wetness and permeability are severe limitations for septic tank absorption fields. The soil is generally not suited to these uses, and alternate sites should be selected.

This soil is in capability subclass Vw and in woodland suitability subclass 2w.

St—Stonelick sandy loam. This is a nearly level, deep, well drained soil on natural levees on flood plains. It is frequently flooded. The areas are irregular or elongated in shape and range from 3 to 60 acres in size.

Typically, the surface layer is dark brown sandy loam about 9 inches thick. The substratum extends to a depth of about 60 inches. In the upper part it is yellowish brown and dark yellowish brown sandy loam, in the middle part it is yellowish brown loamy sand, and in the lower part it is yellowish brown sandy loam. In some places the surface layer and underlying material have more sand. In other places the surface layer is very pale brown or pale brown sand.

Included with this soil in mapping are small areas of Genesee and Shoals soils in slightly lower positions. Also included are other small areas where the surface layer has cobbles and small stones.

Permeability is moderately rapid, and the available water capacity is moderate. The content of organic matter is moderately low. Surface runoff is slow. The surface layer is friable and is easily worked within a wide range of moisture content.

In most areas this soil is used for cultivated crops. In a few small areas it is used as woodland, or it is idle.

This soil is suited to corn and soybeans. However, it is poorly suited to wheat. If rainfall is below normal or is poorly distributed, crops are subject to damage from drought. Conservation tillage that leaves crop residue on the surface, cover crops, and green manure crops or other organic material added to the soil improve the content of organic matter and tilth.

This soil is suited to grasses and legumes for hay or pasture. Overgrazing causes compaction and poor tilth and reduces plant density and hardiness. Proper stocking rates, pasture rotation, timely grazing, and weed control help keep the pasture and soil in good condition.

This soil is well suited to trees. The hazards and limitations are generally slight. Plant competition, however, is moderate. Competing vegetation can be controlled by spraying, cutting, or girdling.

This soil has severe limitations for use as building sites, septic tank absorption fields, and local roads and streets because of flooding. It is generally not suited to these uses, and alternate sites should be selected.

This soil is in capability subclass IIIw and in woodland suitability subclass 2o.

Ta—Taggart silt loam. This is a nearly level, deep, somewhat poorly drained soil on broad flats of outwash plains and valley trains. The areas are irregular in shape and range from 3 to 160 acres in size.

Typically, the surface layer is grayish brown silt loam about 8 inches thick. The subsurface layer is grayish brown silt loam. The subsoil is about 40 inches thick. In the upper part it is yellowish brown mottled, firm silt loam; in the part below that it is grayish brown mottled, firm silt loam; below that it is light gray mottled firm silty clay loam; and in the lowermost part it is yellowish brown mottled, firm clay loam. The substratum to a depth of about 80 inches is strong brown clay loam. In some places the surface layer and subsoil are grayer. In other places the silt cap is thicker.

Included with this soil in mapping are small areas of Parke and Pike soils on low knolls and on adjoining narrow ridges. The included soils make up about 5 percent of this map unit.

Permeability is slow, and the available water capacity is high. The content of organic matter is moderately low. Surface runoff is slow. The water table is often at a depth of 1 to 3 feet in winter and early in spring. The surface layer is friable and is easily worked within a fairly wide range of moisture content. It does, however, have a tendency to puddle and crust after hard rains.

In most areas this soil is used for cultivated crops. In a few small areas it is used as hayland, pasture, or woodland.

This soil is well suited to corn, soybeans, and wheat. Wetness is the major limitation. In most areas the soil has been artificially drained. Land smoothing and shallow surface drains help remove excess surface water. Crop rotation, conservation tillage that leaves crop residue on the surface, cover crops, and green manure crops or other organic material added to the soil help improve fertility and tilth and increase water infiltration.

This soil is well suited to grasses and legumes for hay or pasture. Grasses and legumes should be selected on the basis of the extent of drainage. Overgrazing or grazing when the soil is wet causes compaction and poor tilth and reduces plant density and hardiness. Proper stocking rates, pasture rotation, timely grazing, and weed control help keep the pasture and soil in good condition.

This soil is suited to trees. The hazards and limitations are generally slight. Plant competition, however, is moderate. Competing vegetation can be controlled by cutting, spraying, or girdling.

This soil has severe limitations for use as building sites because of wetness. An adequate drainage system helps overcome this limitation. The soil has severe limitations for septic tank absorption fields because of wetness and slow permeability. Enlarging the filter field and lowering the water table help this soil function better as an absorption field. This soil has severe limitations for local roads and streets because of frost action and low strength. Drainage ditches along roads help reduce frost action. The road base should be strengthened with suitable material.

This soil is in capability subclass IIw and in woodland suitability subclass 3o.

VoA—Vigo silt loam, 0 to 2 percent slopes. This is a nearly level, deep, somewhat poorly drained or poorly drained soil on broad flats on uplands. The areas are irregular in shape and range from 10 to 400 acres in size.

Typically, the surface layer is gray silt loam about 10 inches thick. The subsurface layer is gray mottled silt loam and yellowish brown silty clay loam about 11 inches thick. The subsoil extends to a depth of about 80 inches. In the upper part it is light gray mottled, firm silty clay loam; in the middle part it is yellowish brown mottled, firm clay loam; and in the lower part it is yellowish brown mottled, firm loam. In a few places washed-in silt has accumulated in low swales or narrow, weakly defined drainageways. In a few places the lower part of the subsoil and the substratum are stratified silty clay loam and silt loam.

Included with this soil in mapping are small areas of Ava and Cincinnati soils at heads of drainageways that have slopes of more than 2 percent. The included soils make up about 10 percent of this map unit.

Permeability is slow, and the available water capacity is high. The content of organic matter is moderately low. Surface runoff is slow. The water table is often at a depth of 0.5 to 2.5 feet in winter and early in spring. The surface layer is friable and is easily worked within a fairly wide range of moisture content. It does, however, have a tendency to crust or puddle after hard rains.

In most areas this soil is used for cultivated crops. In a few small areas it is used as hayland, pasture, or woodland.

This soil is suited to corn, soybeans, and wheat. Wetness is the major limitation. In most areas the soil has been artificially drained. Additional subsurface drainage is needed in some areas. Land smoothing and shallow surface drains help remove excess water. Crop rotation, conservation tillage that leaves crop residue on the surface, cover crops, and green manure crops or other organic material added to the soil help improve fertility and tilth and increase water infiltration.

This soil is well suited to grasses and legumes for hay or pasture. Grasses and legumes should be selected on the basis of the extent of drainage. Overgrazing or grazing when the soil is wet causes compaction and poor tilth and reduces plant density and hardiness. Proper stocking rates, pasture rotation, timely grazing, and weed control help keep the pasture and soil in good condition.

This soil is suited to trees. However, the use of equipment is severely limited, and plant competition is severe. Seedling mortality is moderate, and windthrow is a moderate hazard. Harvesting and logging operations are often delayed until the soil is dry or frozen. Some replanting of seedlings may be needed to maintain density of stands. Plant competition can be controlled by cutting, spraying, or girdling.

This soil has severe limitations for use as building sites because of wetness. An adequate drainage system helps overcome this limitation. Buildings should be constructed without basements. Foundation drain tile should be used to help remove excess water. This soil has severe limitations for septic tank absorption fields because of wetness and slow permeability. Enlarging the filter field and lowering the water table help this soil function better as an absorption field. This soil has severe limitations for local roads and streets because of frost action, wetness, and low strength. Drainage measures that lower the water table help reduce frost action. The road base should be strengthened with suitable material.

This soil is in capability subclass IIw and in woodland suitability subclass 2w.

Wa—Wakeland silt loam. This is a nearly level, deep, somewhat poorly drained soil on narrow to moderately broad flood plains of creeks. It is frequently flooded. The areas are elongated and range from 3 to 100 acres in size.

Typically, the surface layer is brown mottled silt loam about 6 inches thick. The substratum extends to a depth of about 60 inches. In the upper part it is brown and light brownish gray silt loam, and in the lower part it is grayish brown mottled, friable silt loam. In a few small places the surface layer is loam, a thin smear of sand is on the surface, or the surface layer and upper part of the substratum are strongly acid. In some places, layers of sandy loam or sand are below a depth of 40 inches.

Included with this soil in mapping are small areas of Haymond and Wilbur soils in slightly higher positions. The included soils make up about 10 percent of this map unit.

Permeability is moderate, and the available water capacity is very high. The content of organic matter is moderately low. Surface runoff is very slow. The water table is often at a depth of 1 to 3 feet in winter and early in spring. The surface layer is friable and is easily worked within a fairly wide range of moisture content. It does, however, have a tendency to puddle and crust after hard rains.

In about half of the areas this soil is used as woodland. In the other areas it is used for cultivated crops, hay, or pasture.

This soil is suited to corn, soybeans, and wheat. Wetness is the major limitation. Flooding is a hazard in most years. In some areas the soil has been artificially drained. Conservation tillage that leaves crop residue on the surface, crop rotation, cover crops, and green manure crops or other organic material added to the soil help improve fertility and tilth and increase water infiltration.

This soil is suited to grasses and legumes for hay or pasture. Grasses and legumes should be selected on the basis of the extent of drainage. Overgrazing or grazing when the soil is wet causes compaction and poor tilth and reduces plant density and hardiness. Proper stocking rates, pasture rotation, timely grazing, and weed control help keep the pasture and soil in good condition.

This soil is well suited to trees. The hazards and limitations are generally slight. Plant competition, however, is moderate. Competing vegetation can be controlled by spraying, cutting, or girdling.

This soil has severe limitations for use as building sites, septic tank absorption fields, and local roads and streets because of flooding. Wetness is an additional limitation for building sites and septic tank absorption fields. Frost action is an additional severe limitation for roads and streets. The soil is generally not suited to these uses, and alternate sites should be selected.

This soil is in capability subclass IIw and in woodland suitability subclass 2o.

WcG—Weikert channery silt loam, 40 to 80 percent slopes. This is a very steep, shallow, well drained soil on back slopes and foot slopes of strongly disscted uplands. The areas are elongated or irregular in shape and range from 10 to 200 acres in size.

Typically, the surface layer is dark grayish brown channery silt loam about 3 inches thick. The subsoil is light yellowish brown, channery friable silt loam about 6 inches thick. The substratum to a depth of about 17 inches is light yellowish brown, very channery silt loam. Sandstone bedrock is below a depth of 17 inches. In some places depth to bedrock is more than 20 inches.

Included with this soil in mapping are small areas of moderately deep Berks and Gilpin soils and deep Hickory soils that have slopes of less than 40 percent. Also included are small areas of Wakeland, Wilbur, and Haymond soils on bottom lands. The included soils make up about 20 percent of this map unit.

Permeability is moderately rapid, and the available water capacity is very low. The content of organic matter is moderately low. Surface runoff is very rapid. Root development is restricted below a depth of about 17 inches by bedrock.

In most areas this soil is used as woodland. In a few small areas it is used as pasture.

This soil is generally not suited to corn, soybeans, small grain, hay, and pasture because of slope, stones, and the low available water capacity.

This soil is suited to trees. However, the use of equipment is severely limited, and seedling mortality is high. The hazard of erosion is moderate, and the windthrow hazard is also moderate. It is difficult to operate some types of logging equipment because of the very steep slopes. Some replanting of seedlings is necessary to maintain density of stands. Logging roads should be placed on the contour where possible to reduce erosion.

This soil has severe limitations for use as building sites, septic tank absorption fields, and local roads and streets because of slope and depth to bedrock. It is generally not suited to these uses, and alternate sites should be selected.

This soil is in capability subclass VIIe and in woodland suitability subclass 4d.

WfC—Wellston silt loam, 6 to 12 percent slopes. This is a moderately sloping, deep, well drained soil on shoulder slopes of ridgetops. The areas are irregular or elongated in shape and range from 3 to 25 acres in size.

Typically, the surface layer is very dark grayish grown silt loam about 3 inches thick. The subsurface layer is yellowish brown silt loam about 4 inches thick. The subsoil is about 43 inches thick. In the upper part it is yellowish brown, friable silt loam; in the middle part it is brown, firm silty clay loam; and in the lower part it is strong brown, firm silt loam and loam. The substratum is sandstone bedrock. In places the subsoil has more sand.

Included with this soil in mapping are small areas of moderately deep Gilpin and Berks soils that have slopes of more than 12 percent and small areas of Zanesville soils that have a fragipan and have slopes of less than 6 percent. The included soils make up about 20 percent of this map unit.

Permeability is moderate, and the available water capacity is high. The content of organic matter is moderately low. Surface runoff is medium. The surface layer is friable and is easily worked within a fairly wide range of moisture content. It does, however, have a tendency to crust or puddle after hard rains.

In most areas this soil is used as woodland. In a few small areas it is used as hayland or pasture.

This soil is suited to corn, soybeans, and wheat. If this soil is used for cultivated crops, erosion is the main hazard. Tile outlet terraces, contour farming, diversions, grassed waterways, or grade stabilization structures are needed to control surface runoff and erosion. Conservation tillage that leaves crop residue on the surface, crop rotation, cover crops, and green manure crops or other organic material added to the soil help improve the content of organic matter and tilth and thus reduce crusting.

This soil is well suited to grasses and legumes for hay or pasture. Grasses and legumes effectively control erosion. Overgrazing causes compaction and poor tilth and reduces plant density and hardiness. Proper stocking rates, pasture rotation, timely grazing, and weed control help keep the pasture and soil in good condition.

This soil is well suited to trees. The hazards and limitations are generally slight. Plant competition, however, is moderate. Competing vegetation can be controlled by spraying, cutting, or girdling.

This soil has moderate limitations for use as building sites because of slope. Slope can be modified by grading. Bedrock needs to be excavated if buildings with basements are constructed. This soil has moderate limitations for septic tank absorption fields because of depth to bedrock, slope, and permeability. Enlarging the filter field helps this soil function better as an absorption field. Careful design helps overcome depth to bedrock and slope. This soil has severe limitations for local roads and streets because of frost action. Drainage ditches along roads help prevent damage from frost action. The road base should be strengthened with suitable material.

This soil is in capability subclass IIIe and in woodland suitability subclass 2o.

Wr—Whitaker loam. This is a nearly level, deep, somewhat poorly drained soil on broad outwash plains and lakebeds. The areas are irregular in shape and range from 3 to 100 acres in size.

Typically, the surface layer is dark grayish brown loam about 9 inches thick. The subsoil is about 40 inches thick. In the upper part it is light yellowish brown mottled, friable loam; in the middle part it is brown mottled, firm clay loam; and in the lower part it is pale brown mottled, firm clay loam. The substratum to a depth of about 60 inches is mottled dark grayish brown and yellowish brown stratified sandy loam and loamy sand. In some places the surface layer is fine sandy loam or silt loam.

Included with this soil in mapping are small areas of Martinsville and Rensselaer soils. Martinsville soils are on slightly higher knolls and Rensselaer soils are in low swales and very narrow drainageways. The included soils make up about 5 percent of this map unit.

Permeability is moderate, and the available water capacity is high. The content of organic matter is moderately low. Surface runoff is slow. The water table is often at a depth of 1 to 3 feet in winter and early in spring. The surface layer is friable and is easily worked within a fairly wide range of moisture content. It does, however, have a tendency to crust or puddle after hard rains.

In most areas this soil is used for cultivated crops. In the rest of the areas it is used as pasture or woodland.

This soil is suited to corn, soybeans, and wheat. Wetness is the major limitation. In most areas, the soil has been artificially drained. Additional tile drainage is needed in some areas. Conservation tillage that leaves crop residue on the surface, crop rotation, cover crops, and green manure crops or other organic material added to the soil help improve fertility and tilth and increase water infiltration.

This soil is suited to grasses and legumes for hay or pasture. Grasses and legumes should be selected on the basis of the extent of drainage. Overgrazing or grazing when the soil is wet causes compaction and poor tilth and reduces plant density and hardiness. Proper stocking rates, pasture rotation, timely grazing, and weed control help keep the pasture and soil in good condition.

This soil is well suited to trees. The hazards and limitations are generally slight. Plant competition, however, is moderate. Competing vegetation can be controlled by spraying, cutting, or girdling.

This soil has severe limitations for use as building sites because of wetness. Adequate drainage helps overcome this limitation. Dwellings should be constructed without basements. Foundation drain tile should be used to remove excess water. This soil has severe limitations for septic tank absorption fields because of wetness. Lowering the water table helps the soil function better as an absorption field. This soil has severe limitations for local roads and streets because of frost action and low strength. Drainage ditches along roads help reduce damage from frost action. The road base should be strengthened with suitable material.

This soil is in capability subclass IIw and in woodland suitability subclass 3o.

Wu—Wilbur silt loam. This is a nearly level, deep, moderately well drained soil on narrow to moderately broad flood plains of creeks. It is frequently flooded. The areas are elongated or irregular in shape and range from 3 to 100 acres in size.

Typically, the surface layer is dark grayish brown silt loam about 5 inches thick. The substratum extends to a depth of about 60 inches. In the upper part it is brown silt loam, and in the lower part it is yellowish brown mottled silt loam. In a few small places the surface layer is loam, a thin smear of sand is on the surface, or the surface layer and upper part of the substratum are strongly acid. In some places sandy loam or sand is below a depth of 40 inches.

Included with this soil in mapping are small areas of Haymond soils in slightly higher positions and small areas of Wakeland soils in slightly lower positions. The included soils make up about 15 percent of this map unit.

Permeability is moderate, and the available water capacity is very high. The content of organic matter is moderately low. Surface runoff is slow. The water table is often at a depth of 3 to 6 feet in winter and early in spring. The surface layer is friable and is easily worked within a fairly wide range of moisture content. It does, however, have a tendency to puddle and crust after hard rains.

In about half of the areas this soil is used as woodland. In the other areas it is used for cultivated crops, hay, or pasture.

This soil is suited to corn and soybeans. However, it is poorly suited to wheat. Flooding is the major hazard. Conservation tillage that leaves crop residue on the surface, crop rotation, cover crops, and green manure crops or other organic material added to the soil help improve fertility and tilth and increase water infiltration.

This soil is suited to grasses and legumes for hay or pasture. Overgrazing or grazing when the soil is wet causes compaction and poor tilth and reduces plant density and hardiness. Proper stocking rates, pasture rotation, timely grazing, and weed control help keep the pasture and soil in good condition.

This soil is well suited to trees. The hazards and limitations are generally slight. Plant competition, however, is moderate. Competing vegetation can be controlled by spraying, cutting, or girdling.

This soil has severe limitations for use as building sites, septic tank absorption fields, and local roads and streets because of flooding. Wetness is an additional severe limitation for septic tank absorption fields, and

frost action is an additional severe limitation for roads and streets. The soil is generally not suited to these uses, and alternate sites should be selected.

This soil is in capability subclass IIw and in woodland suitability subclass 1o.

XeB2—Xenia silt loam, 2 to 7 percent slopes, eroded. This is a gently sloping, deep, moderately well drained soil on narrow to moderately broad ridgetops, shoulder slopes, and knolls of uplands. The areas are irregular in shape and range from 3 to 60 acres in size.

Typically, the surface layer is brown silt loam about 7 inches thick. The subsoil is about 49 inches thick. In the upper part it is yellowish brown, firm silty clay loam; in the middle part it is yellowish brown mottled, firm silty clay loam; and in the lower part it is yellowish brown mottled, firm clay loam and loam. The substratum to a depth of about 60 inches is pale brown and yellowish brown loam that has free carbonates. In some places the silt cap is less than 20 inches or more than 40 inches thick. In other places the surface layer is silty clay loam. In places the depth to free carbonates is less than 40 inches.

Included with this soil in mapping are small areas of Fincastle soils that have slopes of less than 2 percent and small areas of Miami and Russell soils that have slopes of more than 7 percent. The included soils make up about 15 percent of this map unit.

Permeability is moderately slow, and the available water capacity is high. The content of organic matter is moderately low. Surface runoff is medium. The water table is often at a depth of 2 to 6 feet in winter and early in spring. The surface layer is friable and is easily worked within a fairly wide range of moisture content. It does, however, have a tendency to puddle and crust after hard rains, especially in areas where the surface soil is mixed with subsoil.

In most areas this soil is used for cultivated crops. In a few small areas it is used as pasture or woodland.

This soil is suited to corn, soybeans, and wheat. If it is used for cultivated crops, erosion is the main hazard. Tile outlet terraces, diversions, grassed waterways, or grade stabilization structures are needed to control surface runoff and erosion. Conservation tillage that leaves crop residue on the surface, crop rotation, cover crops, and green manure crops or other organic material added to the soil help improve and maintain the content of organic matter and tilth and reduce crusting and erosion.

This soil is well suited to grasses and legumes for hay or pasture. Grasses and legumes effectively control erosion. Overgrazing or grazing when the soil is wet causes compaction and poor tilth and reduces plant density and hardiness. Proper stocking rates, pasture rotation, timely grazing, and weed control help keep the pasture and soil in good condition.

This soil is well suited to trees. The hazards and limitations are generally slight. Plant competition, however, is moderate. Competing vegetation can be controlled by spraying, cutting, or girdling.

This soil has moderate limitations for buildings without basements because of the shrink-swell potential and wetness. It has severe limitations for dwellings with basements because of wetness. Dwellings should be constructed without basements. Foundations and footings should be properly designed to help prevent structural damage caused by the shrinking and swelling of the soil. Foundation drain tile should be used to help remove excess water. This soil has severe limitations for septic tank absorption fields because of permeability and wetness. Enlarging the filter field and lowering the water table help this soil function better as an absorption field. This soil has severe limitations for local roads and streets because of frost action and low strength. Drainage ditches along roads help reduce damage from frost action. The road base should be strengthened with suitable material.

This soil is in capability subclass IIe and in woodland suitability subclass 1o.

ZaB—Zanesville silt loam, 2 to 6 percent slopes. This is a gently sloping, deep, well drained soil on narrow to broad ridgetops. The areas are irregular in shape and range from 5 to 40 acres in size.

Typically, the surface layer is dark grayish brown silt loam about 4 inches thick. The subsurface layer is dark yellowish brown, friable silt loam about 5 inches thick. The subsoil is about 47 inches thick. In the upper part it is brown, friable and firm silt loam; in the part below that it is brown and dark brown, firm silty clay loam and silt loam; in the part below that it is dark brown, firm and brittle silt loam; and in the lower part it is brown, firm clay loam. The underlying material is fractured sandstone bedrock. In some places the depth to bedrock is more than 80 inches.

Included with this soil in mapping are small areas of Wellston soils on low knolls on ridgetops and small areas of moderately deep Gilpin and Berks soils on upper side slopes below the ridgetops. Also included are small areas of soils that are similar to Zanesville soils but have mottles closer to the surface and very small areas where the soils have a surface layer and upper subsoil that have eroded, forming V-shaped gullies. The included soils make up about 20 percent of this map unit.

Permeability is moderate in the upper subsoil and slow in the fragipan. The available water capacity is moderate. The content of organic matter is moderately low. Surface runoff is medium. The water table is often at a depth of 2 to 3 feet in winter and early in spring. The surface layer is friable and is easily worked within a fairly wide range of moisture content. However, if it is cultivated it has a tendency to puddle and crust after hard rains, especially in areas where the surface soil is mixed with subsoil. A fragipan restricts rooting depth below a depth of about 34 inches.

In most areas this soil is used as woodland. In a few small areas it is used for hay, pasture, or cultivated crops.

This soil is suited to corn, soybeans, and wheat. Erosion is the major hazard. The fragipan restricts root development of some plants and causes moisture stress during dry periods. Contour farming, tile outlet terraces, diversions, or grassed waterways are needed to control surface runoff and reduce erosion. Conservation tillage that leaves crop residue on the surface, crop rotation, cover crops, and green manure crops or other organic material added to the soil help improve the content of organic matter and tilth. They also reduce crusting and erosion.

This soil is suited to grasses and legumes for hay or pasture. Grasses and legumes effectively control erosion. They should be selected on the basis of tolerance to frost heave and restricted rooting depth. Overgrazing or grazing when the soil is wet causes compaction and poor tilth and reduces plant density and hardiness. Proper stocking rates, pasture rotation, timely grazing, and weed control help keep the pasture and soil in good condition.

This soil is well suited to trees. The hazards and limitations are generally slight. Plant competition, however, is moderate. Competing vegetation can be controlled by spraying, cutting, or girdling.

This soil has severe limitations for buildings with basements and moderate limitations for buildings without basements because of wetness. An adequate drainage system helps prevent wetness. Foundation drain tile should be used to help remove excess water. This soil has severe limitations for septic tank absorption fields because of wetness and slow permeability in the fragipan. It is generally not suited to this use. This soil has severe limitations for local roads and streets because of low strength. Drainage ditches along roads help reduce damage from frost action. The road base should be strengthened with suitable material.

This soil is in capability subclass IIe and in woodland suitability subclass 3o.

ZaC—Zanesville silt loam, 6 to 12 percent slopes. This is a moderately sloping, deep, well drained soil on shoulder slopes of narrow to broad ridgetops. The areas are irregular in shape and range from 3 to 20 acres in size.

Typically, the surface layer is brown silt loam about 3 inches thick. The subsurface layer is dark yellowish brown silt loam about 4 inches thick. The subsoil is about 53 inches thick. In the upper part it is brown, friable silt loam; in the part below that it is strong brown firm silty clay loam; in the part below that it is yellowish brown firm and brittle, silt loam; and in the lower part it is yellowish brown, firm loam. Sandstone bedrock is below a depth of 60 inches. In some places the silt cap is less than 30 inches thick, and depth to bedrock is more than 80 inches.

Included with this soil in mapping are small areas of moderately deep Gilpin and Berks soils that have steeper slopes and small areas where the soil is gullied. The included soils make up about 15 percent of this map unit.

Permeability is moderate in the upper subsoil and slow in the fragipan. The available water capacity is moderate. The content of organic matter is moderately low. Surface runoff is medium. The water table is often at a depth of 2 to 3 feet in winter and early in spring. The surface layer is friable and is easily worked within a fairly wide range of moisture content. However, if it is cultivated it has a tendency to puddle and crust after hard rains, especially in areas where the surface soil is mixed with subsoil.

In most areas this soil is used as woodland. In a few small areas it is used for hay, pasture, or cultivated crops.

This soil is suited to corn, soybeans, and small grain. Erosion is the major hazard. The fragipan restricts root development of some plants and causes moisture stress during extended dry periods. Tile outlet terraces, contour farming diversions, or grassed waterways are needed to control surface runoff and erosion. Conservation tillage that leaves crop residue on the surface, crop rotation, cover crops, and green manure crops or other organic material added to the soil help improve the content of organic matter and reduce crusting and erosion.

This soil is suited to grasses and legumes for hay or pasture. Grasses and legumes effectively control erosion. They should be selected on the basis of tolerance to frost heave and restricted rooting depth. Overgrazing or grazing when the soil is wet causes compaction and poor tilth and reduces plant density and hardiness. Proper stocking rates, pasture rotation, timely grazing, and weed control help keep the pasture and soil in good condition.

This soil is well suited to trees. The hazards and limitations are generally slight. Plant competition, however, is moderate. Competing vegetation can be controlled by spraying, cutting, or girdling.

This soil has severe limitations for buildings with basements because of wetness and moderate limitations for buildings without basements because of wetness and slope. Adequate drainage helps overcome wetness. Buildings should be constructed without basements. Foundation drain tile should be used to help remove excess water. This soil has severe limitations for septic tank absorption fields because of wetness and slow permeability in the fragipan. It is generally not suited to this use. This soil has severe limitations for local roads and streets because of low strength. The road base should be strengthened with suitable material.

This soil is in capability subclass IIIe and in woodland suitability subclass 3o.

Zp—Zipp silty clay loam. This is a nearly level, deep, very poorly drained soil in slight depressions on lake

plains and slack water terraces. It is ponded by runoff from adjacent soils. The areas are irregular in shape and range from 5 to 50 acres in size.

Typically, the surface layer is dark gray silty clay loam about 6 inches thick. The subsurface layer is dark gray silty clay loam about 5 inches thick. The subsoil is about 30 inches thick. In the upper part it is gray, mottled, very firm silty clay loam; in the middle part it is gray, mottled, very firm silty clay; and in the lower part it is dark gray and gray, mottled, very firm silty clay loam. The substratum to a depth of about 60 inches is light gray, mottled silty clay loam. In many places the surface layer is darker than the typical color. In other places the surface layer and subsoil have less clay and more sand, and the substratum has more sand.

Included with this soil in mapping are small areas of darker colored Patton and Rensselaer soils in similar positions and Whitaker soils in slightly higher positions. The included soils make up about 5 percent of this map unit.

Permeability is very slow, and the available water capacity is high. The content of organic matter is moderate. Surface runoff is very slow. The water table is often at or above the surface in winter and early in spring. The surface layer is firm. It can be worked within only a very narrow range of moisture content. Working the soil when it is wet causes compaction, puddling, or clodding.

In most areas this soil is used for cultivated crops. In a few small areas it is in pasture or is used as woodland.

This soil is suited to corn and soybeans. It is poorly suited to small grain. In most areas the soil has been drained. However, additional drainage is needed in some areas. Land smoothing and shallow surface drains can be used to help remove excess surface water. Conservation tillage that leaves crop residue on the surface, crop rotation, cover crops, and green manure crops or the addition of other organic material help improve fertility and tilth and increase water infiltration.

This soil is suited to grasses and legumes for hay or pasture. Grasses and legumes should be selected on the basis of extent of drainage. Overgrazing or grazing when the soil is wet causes compaction and poor tilth and reduces plant density and hardiness. Proper stocking rates, pasture rotation, timely grazing, and weed control help keep the pasture and soil in good condition.

This soil is suited to trees. Nevertheless, the use of equipment is severely limited, seedling mortality is high, windthrow is a severe hazard, and plant competition is severe. Harvesting of trees is often delayed until the soil is dry or frozen. Some replanting of seedlings is usually necessary. Plant competition can be controlled by cutting, spraying, or girdling.

This soil has severe limitations for use as building sites because of ponding and the shrink-swell potential. Drainage is needed to prevent ponding. Buildings should be constructed without basements. Foundations and footings should be properly designed to help prevent structural damage from the shrinking and swelling of the soil. This soil has severe limitations for use as septic tank absorption fields because of slow permeability and ponding. It is generally not suited to this use. This soil has severe limitations for local roads and streets because of low strength and ponding. The road base should be strengthened with suitable material. Elevating the roadbed helps prevent ponding.

This soil is in capability subclass IIIw and in woodland suitability subclass 2w.

use and management of the soils

This soil survey is an inventory and evaluation of the soils in the survey area. It can be used to adjust land uses to the limitations and potentials of natural resources and the environment. Also, it can help avoid soil-related failures in land uses.

In preparing a soil survey, soil scientists, conservationists, engineers, and others collect extensive field data about the nature and behavior characteristics of the soils. They collect data on erosion, droughtiness, flooding, and other factors that affect various soil uses and management. Field experience and collected data on soil properties and performance are used as a basis in predicting soil behavior.

Information in this section can be used to plan the use and management of soils for crops and pasture; as woodland; as sites for buildings, sanitary facilities, highways and other transportation systems, and parks and other recreation facilities; and for wildlife habitat. It can be used to identify the potentials and limitations of each soil for specific land uses and to help prevent construction failures caused by unfavorable soil properties.

Planners and others using soil survey information can evaluate the effect of specific land uses on productivity and on the environment in all or part of the survey area. The survey can help planners to maintain or create a land use pattern in harmony with the natural soil.

Contractors can use this survey to locate sources of sand and gravel, roadfill, and topsoil. They can use it to identify areas where bedrock, wetness, or very firm soil layers can cause difficulty in excavation.

Health officials, highway officials, engineers, and others may also find this survey useful. The survey can help them plan the safe disposal of wastes and locate sites for pavements, sidewalks, campgrounds, playgrounds, lawns, and trees and shrubs.

crops and pasture

General management needed for crops and pasture is suggested in this section. The crops or pasture plants best suited to the soils, including some not commonly grown in the survey area, are identified; the system of land capability classification used by the Soil Conservation Service is explained; and the estimated yields of the main crops and hay and pasture plants are listed for each soil.

Planners of management systems for individual fields or farms should consider the detailed information given in the description of each soil under "Detailed soil map units." Specific information can be obtained from the local office of the Soil Conservation Service or the Cooperative Extension Service.

In 1967, approximately 43 percent of the land area of Morgan County was cropland, 11 percent was pasture, and 28 percent was woodland or forest, according to the Conservation Needs Inventory of that year. Acreage in crops and pasture has been decreasing as more and more land is used for urban development.

The soils in Morgan County have only fair potential for increased production of food. Most of the potentially good cropland is now being cultivated. Small isolated areas of potentially good cropland are on narrow ridgetops and in narrow bottom lands. Most of these areas are presently woodland.

Some marginal areas that are now cropland are better suited to use for hay or pasture or trees. Crop production can best be increased through the application of the latest crop production technology to all the cropland in the county and through new and better technology in the future. This survey can greatly facilitate the wisest use of such technology.

Only about 2 percent of the land area of Morgan County is class I soils that have few limitations for crops.

Wetness is the major problem on many of the soils used as cropland and pasture. Most of the poorly drained, very poorly drained, and somewhat poorly drained soils have been artificially drained. The type of drainage needed varies with the soil.

The very poorly drained Brookston and Rensselaer soils are well suited to subsurface drains. The poorly drained Evansville and Patton soils are suited to subsurface drains if outlets are available. The very poorly drained Milford, Montgomery, and Zipp soils are slowly permeable because of the high content of clay, and subsurface drains are not very effective. Surface drainage is usually needed on these soils. Surface drains may be necessary to drain small pockets on any of these poorly drained and very poorly drained soils. Open ditches are usually necessary in the larger areas, in addition to subsurface and surface drains.

The somewhat poorly drained Reesville, Fincastle, Taggart, Crosby, Iva, and Whitaker soils are well suited to subsurface drains. This method is usually sufficient. The somewhat poorly drained Bartle soil is not suited to tile drainage because of the very slowly permeable fragipan, and surface drainage is usually necessary. The

somewhat poorly drained Banlic soil has a slowly permeable subsoil that is similar to a fragipan. Tile drainage is not effective, and surface drainage is usually needed. Both subsurface and surface drainage are usually needed on the somewhat poorly drained and poorly drained Vigo soils.

The poorly drained Bonnie, very poorly drained Sloan, and the somewhat poorly drained Shoals and Wakeland soils are on low-lying flood plains. These soils are suited to subsurface drainage, but suitable outlets may not be available. Surface drainage is often feasible. Diversion terraces on the adjacent higher lying soils help carry excess runoff to an adequate outlet and help prevent ponding on the lower lying soils.

The moderately well drained Ava and Bedford soils and the well drained Cincinnati and Zanesville soils have a slowly permeable fragipan and dry out slowly after rains. Drainage may be needed if these soils are intensively cropped. The moderately well drained Xenia soils may need subsurface drainage in a few areas for optimum crop production.

Information on drainage design for each soil is available at the local offices of the Soil Conservation Service.

Erosion is a hazard on most of the sloping soils. Soils that have a sandy surface texture, Bloomfield and Princeton soils, for example, are not as susceptible to water erosion as soils that have a silty surface texture, Alford and Parke soils, for example. Soils that have a slowly permeable subsoil, Cincinnati and Zanesville soils, for example, are very susceptible to erosion. Soil erosion removes plant nutrients and topsoil, cuts gullies, and fills ditches, creeks, and rivers with harmful sediment and chemicals. Tile outlet terraces, diversions, crop rotation that includes grasses and legumes, grassed waterways, conservation tillage, contour farming, crop residue management, and cover crops help reduce runoff and sheet erosion (fig. 3).

Soil tilth is an important factor in the germination of seeds and in the infiltration of water into the soil. Soils with good tilth are granular and porous. Soils that have a sandier surface layer, Princeton soils, for example, are generally easy to till. Soils that have a more clayey surface layer, Montgomery and Zipp soils, for example, are difficult to till. These soils absorb water slowly and tend to puddle. Water runs off rather than soaks in. Growing green manure crops, leaving crop residue on the surface, and adding other organic material such as manure help improve tilth on all of the soils. However, the improvement is most noticeable on soils that have a more clayey surface layer.

The natural fertility of most of the soils in Morgan County has been reduced because these soils have been farmed or used as pasture for many years. Natural fertility is generally highest in the soils on flood plains, Genesee and Ross soils, for example, which are flooded by runoff from watersheds. It is generally lowest in the soils that formed in sandstone and shale residuum, Gilpin and Berks soils, for example. On all of the soils, the addition of lime and fertilizer should be based on the results of soil tests, the needs of the crop, and the expected yields. The Cooperative Extension Service can help in determining the kind and amount of fertilizer and lime to apply.

Field crops that are suited to the soils and climate of Morgan County and that are commonly grown include grain crops such as corn, soybeans, and wheat; legumes such as alfalfa, red clover, and white clover; and grasses such as orchardgrass, tall fescue, and bluegrass. Field crops not now commonly grown in the county but to which the soils are suited include legumes such as lespedeza, crownvetch, and ladino clover; grain crops such as sunflowers, barley, oats, rye, and grain sorghum; and grasses such as bromegrass, sudangrass, and timothy.

Specialty crops are of limited commercial importance in the county. Only a small acreage is now used for fruits and vegetables. Information on specialty crops can be obtained from the local offices of the Cooperative Extension Service and the Soil Conservation Service.

yields per acre

The average yields per acre that can be expected of the principal crops under a high level of management are shown in table 6. In any given year, yields may be higher or lower than those indicated in the table because of variations in rainfall and other climatic factors.

The yields are based mainly on the experience and records of farmers, conservationists, and extension agents. Available yield data from nearby counties and results of field trials and demonstrations are also considered.

The management needed to obtain the indicated yields of the various crops depends on the kind of soil and the crop. Management can include drainage, erosion control, and protection from flooding; the proper planting and seeding rates; suitable high-yielding crop varieties; appropriate and timely tillage; control of weeds, plant diseases, and harmful insects; favorable soil reaction and optimum levels of nitrogen, phosphorus, potassium, and trace elements for each crop; effective use of crop residue, barnyard manure, and green-manure crops; and harvesting that insures the smallest possible loss.

The estimated yields reflect the productive capacity of each soil for each of the principal crops. Yields are likely to increase as new production technology is developed. The productivity of a given soil compared with that of other soils, however, is not likely to change.

Crops other than those shown in table 6 are grown in the survey area, but estimated yields are not listed because the acreage of such crops is small. The local office of the Soil Conservation Service or of the Cooperative Extension Service can provide information about the management and productivity of the soils.

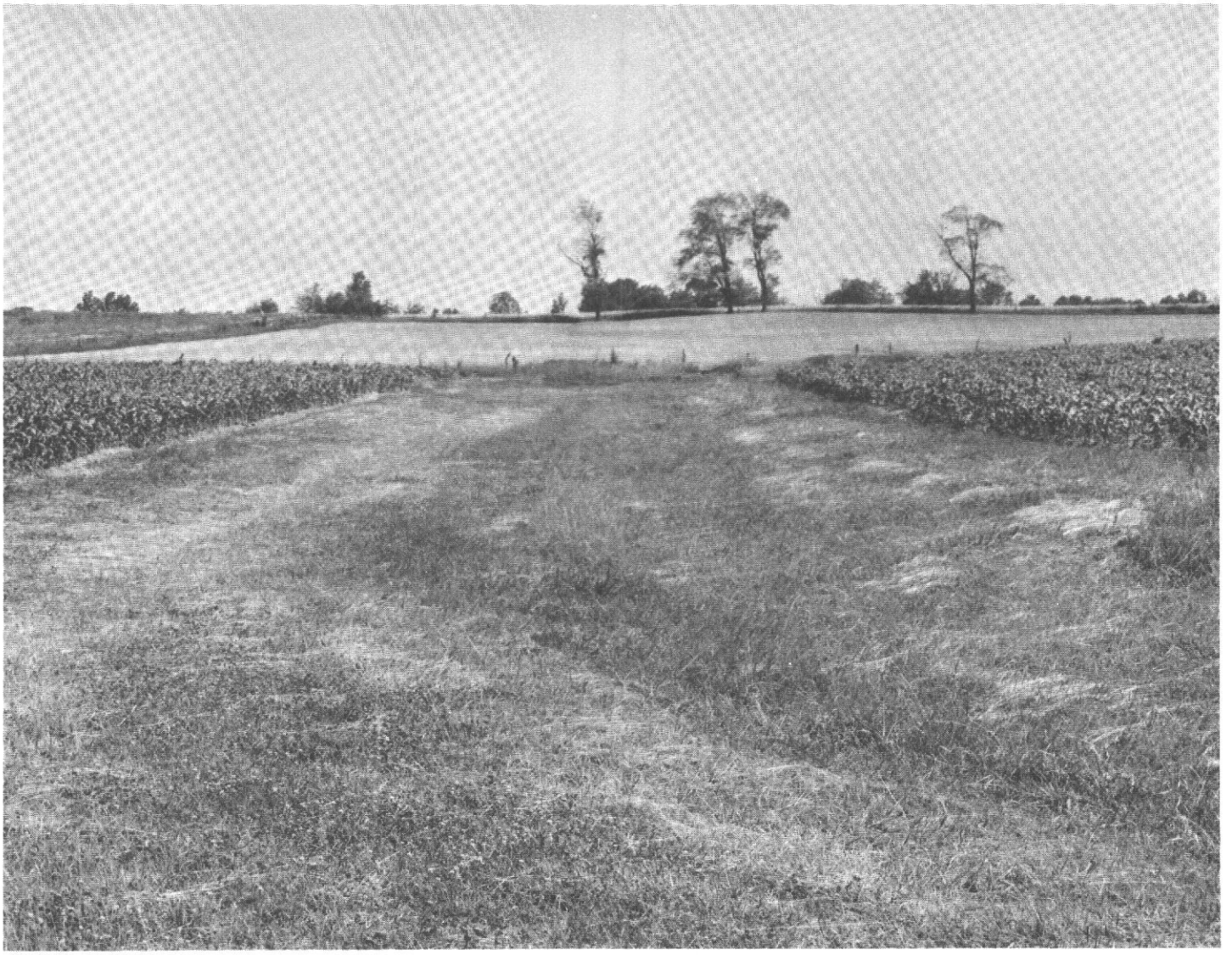


Figure 3.—This grassed waterway on Fincastle silt loam, 0 to 3 percent slopes, helps reduce sheet erosion.

land capability classification

Land capability classification shows, in a general way, the suitability of soils for most kinds of field crops. Crops that require special management are excluded. The soils are grouped according to their limitations for field crops, the risk of damage if they are used for crops, and the way they respond to management. The grouping does not take into account major and generally expensive landforming that would change slope, depth, or other characteristics of the soils, nor does it consider possible but unlikely major reclamation projects. Capability classification is not a substitute for interpretations designed to show suitability and limitations of groups of soils for woodland and for engineering purposes.

In the capability system, soils are generally grouped at three levels: capability class, subclass, and unit. Only class and subclass are used in this survey. These levels are defined in the following paragraphs.

Capability classes, the broadest groups, are designated by Roman numerals I through VIII. The numerals indicate progressively greater limitations and narrower choices for practical use. The classes are defined as follows:

Class I soils have slight limitations that restrict their use.

Class II soils have moderate limitations that reduce the choice of plants or that require moderate conservation practices.

Class III soils have severe limitations that reduce the choice of plants or that require special conservation practices, or both.

Class IV soils have very severe limitations that reduce the choice of plants or that require very careful management, or both.

Class V soils are not likely to erode but have other limitations, impractical to remove, that limit their use.

Class VI soils have severe limitations that make them generally unsuitable for cultivation.

Class VII soils have very severe limitations that make them unsuitable for cultivation.

Class VIII soils and miscellaneous areas have limitations that nearly preclude their use for commercial crop production.

Capability subclasses are soil groups within one class. They are designated by adding a small letter, *e, w, s,* or *c,* to the class numeral, for example, IIe. The letter *e* shows that the main limitation is risk of erosion unless close-growing plant cover is maintained; *w* shows that water in or on the soil interferes with plant growth or cultivation (in some soils the wetness can be partly corrected by artificial drainage); *s* shows that the soil is limited mainly because it is shallow, droughty, or stony; and *c*, used in only some parts of the United States, shows that the chief limitation is climate that is very cold or very dry.

In class I there are no subclasses because the soils of this class have few limitations. Class V contains only the subclasses indicated by *w, s,* or *c* because the soils in class V are subject to little or no erosion. They have other limitations that restrict their use to pasture, rangeland, woodland, wildlife habitat, or recreation.

The acreage of soils in each capability subclass is shown in table 7. The capability classification of each map unit is given in the section "Detailed soil map units."

woodland management and productivity

Table 8 can be used by woodland owners or forest managers in planning the use of soils for wood crops. Only those soils suitable for wood crops are listed. The table lists the ordination (woodland suitability) symbol for each soil. Soils assigned the same ordination symbol require the same general management and have about the same potential productivity.

The first part of the *ordination symbol*, a number, indicates the potential productivity of the soils for important trees. The number 1 indicates very high productivity; 2, high; 3, moderately high; 4, moderate; and 5, low. The second part of the symbol, a letter, indicates the major kind of soil limitation. The letter *x* indicates stoniness or rockiness; *w*, excessive water in or on the soil; *t*, toxic substances in the soil; *d*, restricted root depth; *c*, clay in the upper part of the soil; *s*, sandy texture; *f*, high content of coarse fragments in the soil profile; and *r*, steep slopes. The letter *o* indicates that limitations or restrictions are insignificant. If a soil has more than one limitation, the priority is as follows: x, w, t, d, c, s, f, and r.

In table 8, *slight, moderate,* and *severe* indicate the degree of the major soil limitations to be considered in management.

Ratings of the *erosion hazard* indicate the risk of loss of soil in well managed woodland. The risk is *slight* if the expected soil loss is small, *moderate* if measures are needed to control erosion during logging and road construction, and *severe* if intensive management or special equipment and methods are needed to prevent excessive loss of soil.

Ratings of *equipment limitation* reflect the characteristics and conditions of the soil that restrict use of the equipment generally needed in woodland management or harvesting. A rating of *slight* indicates that use of equipment is not limited to a particular kind of equipment or time of year; *moderate* indicates a short seasonal limitation or a need for some modification in management or in equipment; and *severe* indicates a seasonal limitation, a need for special equipment or management, or a hazard in the use of equipment.

Seedling mortality ratings indicate the degree to which the soil affects the mortality of tree seedlings. Plant competition is not considered in the ratings. The ratings apply to seedlings from good stock that are properly planted during a period of sufficient rainfall. A rating of *slight* indicates that the expected mortality is less than 25 percent; *moderate*, 25 to 50 percent; and *severe*, more than 50 percent.

Ratings of *windthrow hazard* are based on the soil characteristics that affect the development of tree roots and the ability of the soil to hold trees firmly. A rating of *slight* indicates that a few trees may be blown down by normal winds; *moderate*, that some trees will be blown down during periods of excessive soil wetness and strong winds; and *severe*, that many trees are blow down during periods of excessive soil wetness and moderate or strong winds.

The *potential productivity* of merchantable or *common trees* on a soil is expressed as a *site index*. This index is the average height, in feet, that dominant and codominant trees of a given species attain in a specified number of years. The site index applies to fully stocked, even-aged, unmanaged stands. Commonly grown trees are those that woodland managers generally favor in intermediate or improvement cuttings. They are selected on the basis of growth rate, quality, value, and marketability.

Trees to plant are those that are suited to the soils and to commercial wood production.

windbreaks and environmental plantings

Windbreaks protect livestock, buildings, and yards from wind and snow. They also protect fruit trees and gardens, and they furnish habitat for wildlife. Several rows of low- and high-growing broadleaf and coniferous trees and shrubs provide the most protection.

Field windbreaks are narrow plantings made at right angles to the prevailing wind and at specific intervals across the field. The interval depends on the erodibility of the soil. Field windbreaks protect cropland and crops from wind, hold snow on the fields, and provide food and cover for wildlife.

Environmental plantings help to beautify and screen houses and other buildings and to abate noise. The plants, mostly evergreen shrubs and trees, are closely spaced. To insure plant survival, a healthy planting stock of suitable species should be planted properly on a well prepared site and maintained in good condition.

Table 9 shows the height that locally grown trees and shrubs are expected to reach in 20 years on various soils. The estimates in table 9 are based on measurements and observation of established plantings that have been given adequate care. They can be used as a guide in planning windbreaks and screens. Additional information on planning windbreaks and screens and planting and caring for trees and shrubs can be obtained from local offices of the Soil Conservation Service or the Cooperative Extension Service or from a nursery.

recreation

The soils of the survey area are rated in table 10 according to limitations that affect their suitability for recreation. The ratings are based on restrictive soil features, such as wetness, slope, and texture of the surface layer. Susceptibility to flooding is considered. Not considered in the ratings, but important in evaluating a site, are the location and accessibility of the area, the size and shape of the area and its scenic quality, vegetation, access to water, potential water impoundment sites, and access to public sewerlines. The capacity of the soil to absorb septic tank effluent and the ability of the soil to support vegetation are also important. Soils subject to flooding are limited for recreation use by the duration and intensity of flooding and the season when flooding occurs. In planning recreation facilities, onsite assessment of the height, duration, intensity, and frequency of flooding is essential.

In table 10, the degree of soil limitation is expressed as slight, moderate, or severe. *Slight* means that soil properties are generally favorable and that limitations are minor and easily overcome. *Moderate* means that limitations can be overcome or alleviated by planning, design, or special maintenance. *Severe* means that soil properties are unfavorable and that limitations can be offset only by costly soil reclamation, special design, intensive maintenance, limited use, or by a combination of these measures.

The information in table 10 can be supplemented by other information in this survey, for example, interpretations for septic tank absorption fields in table 13 and interpretations for dwellings without basements and for local roads and streets in table 12.

Camp areas require site preparation, such as shaping and leveling the tent and parking areas, stabilizing roads and intensively used areas, and installing sanitary facilities and utility lines. Camp areas are subject to heavy foot traffic and some vehicular traffic. The best soils have mild slopes and are not wet or subject to flooding during the period of use. The surface has few or no stones or boulders, absorbs rainfall readily but remains firm, and is not dusty when dry. Strong slopes and stones or boulders can greatly increase the cost of constructing campsites.

Picnic areas are subject to heavy foot traffic. Most vehicular traffic is confined to access roads and parking areas. The best soils for picnic areas are firm when wet, are not dusty when dry, are not subject to flooding during the period of use, and do not have slopes or stones or boulders that increase the cost of shaping sites or of building access roads and parking areas.

Playgrounds require soils that can withstand intensive foot traffic. The best soils are almost level and are not wet or subject to flooding during the season of use. The surface is free of stones and boulders, is firm after rains, and is not dusty when dry. If grading is needed, the depth of the soil over bedrock or a hardpan should be considered.

Paths and trails for hiking, horseback riding, and bicycling should require little or no cutting and filling. The best soils are not wet, are firm after rains, are not dusty when dry, and are not subject to flooding more than once a year during the period of use. They have moderate slopes and few or no stones or boulders on the surface.

Golf fairways are subject to heavy foot traffic and some light vehicular traffic. Cutting or filling may be required. The best soils for use as golf fairways are firm when wet, are not dusty when dry, and are not subject to prolonged flooding during the period of use. They have moderate slopes and no stones or boulders on the surface. The suitability of the soil for tees or greens is not considered in rating the soils.

wildlife habitat

Soils affect the kind and amount of vegetation that is available to wildlife as food and cover. They also affect the construction of water impoundments. The kind and abundance of wildlife depend largely on the amount and distribution of food, cover, and water. Wildlife habitat can be created or improved by planting appropriate vegetation, by maintaining the existing plant cover, or by promoting the natural establishment of desirable plants.

In table 11, the soils in the survey area are rated according to their potential for providing habitat for various kinds of wildlife. This information can be used in planning wildlife areas, nature study areas, parks, and other developments for wildlife; in selecting soils that are suitable for establishing, improving, or maintaining specific elements of wildlife habitat; and in determining the intensity of management needed for each element of the habitat.

The potential of the soil is rated good, fair, poor, or very poor. A rating of *good* indicates that the element or kind of habitat is easily established, improved, or maintained. Few or no limitations affect management, and satisfactory results can be expected. A rating of *fair* indicates that the element or kind of habitat can be established, improved, or maintained in most places. Moderately intensive management is required for satisfactory results. A rating of *poor* indicates that limitations are severe for the designated element or kind of habitat. Habitat can be created, improved, or maintained in most places, but management is difficult and must be intensive. A rating of *very poor* indicates that restrictions for the element or kind of habitat are very severe and that unsatisfactory results can be expected. Creating, improving, or maintaining habitat is impractical or impossible.

The elements of wildlife habitat are described in the following paragraphs.

Grain and seed crops are domestic grains and seed-producing herbaceous plants. Soil properties and features that affect the growth of grain and seed crops are depth of the root zone, texture of the surface layer, available water capacity, wetness, slope, surface stoniness, and flood hazard. Soil temperature and soil moisture are also considerations. Examples of grain and seed crops are corn, soybeans, wheat, and oats.

Grasses and legumes are domestic perennial grasses and herbaceous legumes. Soil properties and features that affect the growth of grasses and legumes are depth of the root zone, texture of the surface layer, available water capacity, wetness, surface stoniness, flood hazard, and slope. Soil temperature and soil moisture are also considerations. Examples of grasses and legumes are orchard grass, timothy, redtop, switchgrass, red clover, and ladino clover.

Wild herbaceous plants are native or naturally established grasses and forbs, including weeds. Soil properties and features that affect the growth of these plants are depth of the root zone, texture of the surface layer, available water capacity, wetness, surface stoniness, and flood hazard. Soil temperature and soil moisture are also considerations. Examples of wild herbaceous plants are ragweed, goldenrod, beggarweed, bristlegrass, and smartweed.

Hardwood trees and woody understory produce nuts or other fruit, buds, catkins, twigs, bark, and foliage. Soil properties and features that affect the growth of hardwood trees and shrubs are depth of the root zone, the available water capacity, and wetness. Examples of these trees are oak, poplar, cherry, sweetgum, apple, and hickory. Examples of fruit-producing shrubs that are suitable for planting on soils rated *good* are autumn-olive, crabapple, hawthorn, and dogwood.

Coniferous plants furnish browse, seeds, and cones. Soil properties and features that affect the growth of coniferous trees, shrubs, and ground cover are depth of the root zone, available water capacity, and wetness. Examples of coniferous plants are pine, spruce, fir, cedar, and juniper.

Wetland plants are annual and perennial wild herbaceous plants that grow on moist or wet sites. Submerged or floating aquatic plants are excluded. Soil properties and features affecting wetland plants are texture of the surface layer, wetness, reaction, salinity, slope, and surface stoniness. Examples of wetland plants are smartweed, wild millet, wildrice, rushes, sedges, and reeds.

Shallow water areas have an average depth of less than 5 feet. Some are naturally wet areas. Others are created by dams, levees, or other water-control structures. Soil properties and features affecting shallow water areas are depth to bedrock, wetness, surface stoniness, slope, and permeability. Examples of shallow water areas are marshes, waterfowl feeding areas, and ponds.

The habitat for various kinds of wildlife is described in the following paragraphs.

Habitat for openland wildlife consists of cropland, pasture, meadows, and areas that are overgrown with grasses, herbs, shrubs, and vines. These areas produce grain and seed crops, grasses and legumes, and wild herbaceous plants. The wildlife attracted to these areas include bobwhite quail, pheasant, meadowlark, field sparrow, cottontail, and red fox.

Habitat for woodland wildlife consists of areas of deciduous plants or coniferous plants or both and associated grasses, legumes, and wild herbaceous plants. Wildlife attracted to these areas include wild turkey, ruffed grouse, woodcock, thrushes, woodpeckers, squirrels, gray fox, raccoon, and deer.

Habitat for wetland wildlife consists of open, marshy or swampy shallow water areas. Some of the wildlife attracted to such areas are ducks, geese, herons, shore birds, muskrat, mink, and beaver.

engineering

This section provides information for planning land uses related to urban development and to water management. Soils are rated for various uses, and the most limiting features are identified. The ratings are given in the following tables: Building site development, Sanitary facilities, Construction materials, and Water management. The ratings are based on observed performance of the soils and on the estimated data and test data in the "Soil properties" section.

Information in this section is intended for land use planning, for evaluating land use alternatives, and for planning site investigations prior to design and construction. The information, however, has limitations. For example, estimates and other data generally apply only to that part of the soil within a depth of 5 or 6 feet. Because of the map scale, small areas of different soils may be included within the mapped areas of a specific soil.

The information is not site specific and does not eliminate the need for onsite investigation of the soils or for testing and analysis by personnel experienced in the design and construction of engineering works.

Government ordinances and regulations that restrict certain land uses or impose specific design criteria were not considered in preparing the information in this section. Local ordinances and regulations need to be considered in planning, in site selection, and in design.

Soil properties, site features, and observed performance were considered in determining the ratings in this section. During the fieldwork for this soil survey, determinations were made about grain-size distribution, liquid limit, plasticity index, soil reaction, depth to bedrock, hardness of bedrock within 5 to 6 feet of the surface, soil wetness, depth to a seasonal high water table, slope, likelihood of flooding, natural soil structure aggregation, and soil density. Data were collected about kinds of clay minerals, mineralogy of the sand and silt fractions, and the kind of adsorbed cations. Estimates were made for erodibility, permeability, corrosivity, shrink-swell potential, available water capacity, and other behavioral characteristics affecting engineering uses.

This information can be used to (1) evaluate the potential of areas for residential, commercial, industrial, and recreation uses; (2) make preliminary estimates of construction conditions; (3) evaluate alternative routes for roads, streets, highways, pipelines, and underground cables; (4) evaluate alternative sites for sanitary landfills, septic tank absorption fields, and sewage lagoons; (5) plan detailed onsite investigations of soils and geology; (6) locate potential sources of gravel, sand, earthfill, and topsoil; (7) plan drainage systems, irrigation systems, ponds, terraces, and other structures for soil and water conservation; and (8) predict performance of proposed small structures and pavements by comparing the performance of existing similar structures on the same or similar soils.

The information in the tables, along with the soil maps, the soil descriptions, and other data provided in this survey can be used to make additional interpretations.

Some of the terms used in this soil survey have a special meaning in soil science and are defined in the Glossary.

building site development

Table 12 shows the degree and kind of soil limitations that affect shallow excavations, dwellings with and without basements, small commercial buildings, local roads and streets, and lawns and landscaping. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increases in construction costs, and possibly increased maintenance are required. Special feasibility studies may be required where the soil limitations are severe.

Shallow excavations are trenches or holes dug to a maximum depth of 5 or 6 feet for basements, graves, utility lines, open ditches, and other purposes. The ratings are based on soil properties, site features, and observed performance of the soils. The ease of digging, filling, and compacting is affected by the depth to bedrock, a cemented pan, or a very firm dense layer; stone content; soil texture; and slope. The time of the year that excavations can be made is affected by the depth to a seasonal high water table and the susceptibility of the soil to flooding. The resistance of the excavation walls or banks to sloughing or caving is affected by soil texture and the depth to the water table.

Dwellings and small commercial buildings are structures built on shallow foundations on undisturbed soil. The load limit is the same as that for single-family dwellings no higher than three stories. Ratings are made for small commercial buildings without basements, for dwellings with basements, and for dwellings without basements. The ratings are based on soil properties, site features, and observed performance of the soils. A high water table, flooding, shrink-swell potential, and organic layers can cause the movement of footings. A high water table, depth to bedrock or to a cemented pan, large stones, and flooding affect the ease of excavation and construction. Landscaping and grading that require cuts and fills of more than 5 to 6 feet are not considered.

Local roads and streets have an all-weather surface and carry automobile and light truck traffic all year. They have a subgrade of cut or fill soil material, a base of gravel, crushed rock, or stabilized soil material, and a flexible or rigid surface. Cuts and fills are generally limited to less than 6 feet. The ratings are based on soil properties, site features, and observed performance of the soils. Depth to bedrock or to a cemented pan, a high water table, flooding, large stones, and slope affect the ease of excavating and grading. Soil strength (as inferred from the engineering classification of the soil), shrink-swell potential, frost action potential, and depth to a high water table affect the traffic supporting capacity.

Lawns and landscaping require soils on which turf and ornamental trees and shrubs can be established and maintained. The ratings are based on soil properties, site features, and observed performance of the soils. Soil

reaction, a high water table, depth to bedrock or to a cemented pan, the available water capacity in the upper 40 inches, and the content of salts, sodium, and sulfidic materials affect plant growth. Flooding, wetness, slope, stoniness, and the amount of sand, clay, or organic matter in the surface layer affect trafficability after vegetation is established.

sanitary facilities

Table 13 shows the degree and the kind of soil limitations that affect septic tank absorption fields, sewage lagoons, and sanitary landfills. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increases in construction costs, and possibly increased maintenance are required.

Table 13 also shows the suitability of the soils for use as daily cover for landfills. A rating of *good* indicates that soil properties and site features are favorable for the use and good performance and low maintenance can be expected; *fair* indicates that soil properties and site features are moderately favorable for the use and one or more soil properties or site features make the soil less desirable than the soils rated good; and *poor* indicates that one or more soil properties or site features are unfavorable for the use and overcoming the unfavorable properties requires special design, extra maintenance, or costly alteration.

Septic tank absorption fields are areas in which effluent from a septic tank is distributed into the soil through subsurface tiles or perforated pipe. Only that part of the soil between depths of 24 and 72 inches is evaluated. The ratings are based on soil properties, site features, and observed performance of the soils. Permeability, a high water table, depth to bedrock or to a cemented pan, and flooding affect absorption of the effluent. Large stones and bedrock or a cemented pan interfere with installation.

Unsatisfactory performance of septic tank absorption fields, including excessively slow absorption of effluent, surfacing of effluent, and hillside seepage, can affect public health. Ground water can be polluted if highly permeable sand and gravel or fractured bedrock is less than 4 feet below the base of the absorption field, if slope is excessive, or if the water table is near the surface. There must be unsaturated soil material beneath the absorption field to effectively filter the effluent. Many local ordinances require that this material be of a certain thickness.

Sewage lagoons are shallow ponds constructed to hold sewage while aerobic bacteria decompose the solid and liquid wastes. Lagoons should have a nearly level floor surrounded by cut slopes or embankments of compacted soil. Lagoons generally are designed to hold the sewage within a depth of 2 to 5 feet. Nearly impervious soil material for the lagoon floor and sides is required to minimize seepage and contamination of ground water.

Table 13 gives ratings for the natural soil that makes up the lagoon floor. The surface layer and, generally, 1 or 2 feet of soil material below the surface layer are excavated to provide material for the embankments. The ratings are based on soil properties, site features, and observed performance of the soils. Considered in the ratings are slope, permeability, a high water table, depth to bedrock or to a cemented pan, flooding, large stones, and content of organic matter.

Excessive seepage due to rapid permeability of the soil or a water table that is high enough to raise the level of sewage in the lagoon causes a lagoon to function unsatisfactorily. Pollution results if seepage is excessive or if floodwater overtops the lagoon. A high content of organic matter is detrimental to proper functioning of the lagoon because it inhibits aerobic activity. Slope, bedrock, and cemented pans can cause construction problems, and large stones can hinder compaction of the lagoon floor.

Sanitary landfills are areas where solid waste is disposed of by burying it in soil. There are two types of landfill—trench and area. In a trench landfill, the waste is placed in a trench. It is spread, compacted, and covered daily with a thin layer of soil excavated at the site. In an area landfill, the waste is placed in successive layers on the surface of the soil. The waste is spread, compacted, and covered daily with a thin layer of soil from a source away from the site.

Both types of landfill must be able to bear heavy vehicular traffic. Both types involve a risk of ground water pollution. Ease of excavation and revegetation needs to be considered.

The ratings in table 13 are based on soil properties, site features, and observed performance of the soils. Permeability, depth to bedrock or to a cemented pan, a high water table, slope, and flooding affect both types of landfill. Texture, stones and boulders, highly organic layers, soil reaction, and content of salts and sodium affect trench type landfills. Unless otherwise stated, the ratings apply only to that part of the soil within a depth of about 6 feet. For deeper trenches, a limitation rated slight or moderate may not be valid. Onsite investigation is needed.

Daily cover for landfill is the soil material that is used to cover compacted solid waste in an area type sanitary landfill. The soil material is obtained offsite, transported to the landfill, and spread over the waste.

Soil texture, wetness, coarse fragments, and slope affect the ease of removing and spreading the material during wet and dry periods. Loamy or silty soils that are free of large stones or excess gravel are the best cover

for a landfill. Clayey soils are sticky or cloddy and are difficult to spread; sandy soils are subject to soil blowing.

After soil material has been removed, the soil material remaining in the borrow area must be thick enough over bedrock, a cemented pan, or the water table to permit revegetation. The soil material used as final cover for a landfill should be suitable for plants. The surface layer generally has the best workability, more organic matter, and the best potential for plants. Material from the surface layer should be stockpiled for use as the final cover.

construction materials

Table 14 gives information about the soils as a source of roadfill, sand, gravel, and topsoil. The soils are rated *good, fair,* or *poor* as a source of roadfill and topsoil. They are rated as a probable or improbable source of sand and gravel. The ratings are based on soil properties and site features that affect the removal of the soil and its use as construction material. Normal compaction, minor processing, and other standard construction practices are assumed. Each soil is evaluated to a depth of 5 or 6 feet.

Roadfill is soil material that is excavated in one place and used in road embankments in another place. In this table, the soils are rated as a source of roadfill for low embankments, generally less than 6 feet high and less exacting in design than higher embankments.

The ratings are for the soil material below the surface layer to a depth of 5 or 6 feet. It is assumed that soil layers will be mixed during excavating and spreading. Many soils have layers of contrasting suitability within their profile. The table showing engineering index properties provides detailed information about each soil layer. This information can help determine the suitability of each layer for use as roadfill. The performance of soil after it is stabilized with lime or cement is not considered in the ratings.

The ratings are based on soil properties, site features, and observed performance of the soils. The thickness of suitable material is a major consideration. The ease of excavation is affected by large stones, a high water table, and slope. How well the soil performs in place after it has been compacted and drained is determined by its strength (as inferred from the engineering classification of the soil) and shrink-swell potential.

Soils rated *good* contain significant amounts of sand or gravel or both. They have at least 5 feet of suitable material, low shrink-swell potential, few cobbles and stones, and slopes of 15 percent or less. Depth to the water table is more than 3 feet. Soils rated *fair* are more than 35 percent silt- and clay-sized particles and have a plasticity index of less than 10. They have moderate shrink-swell potential, slopes of 15 to 25 percent, or many stones. Depth to the water table is 1 to 3 feet. Soils rated *poor* have a plasticity index of more than 10, a high shrink-swell potential, many stones, or slopes of more than 25 percent. They are wet, and the depth to the water table is less than 1 foot. They may have layers of suitable material, but the material is less than 3 feet thick.

Sand and gravel are natural aggregates suitable for commercial use with a minimum of processing. Sand and gravel are used in many kinds of construction. Specifications for each use vary widely. In table 14, only the probability of finding material in suitable quantity is evaluated. The suitability of the material for specific purposes is not evaluated, nor are factors that affect excavation of the material.

The properties used to evaluate the soil as a source of sand or gravel are gradation of grain sizes (as indicated by the engineering classification of the soil), the thickness of suitable material, and the content of rock fragments. Kinds of rock, acidity, and stratification are given in the soil series descriptions. Gradation of grain sizes is given in the table on engineering index properties.

A soil rated as a probable source has a layer of clean sand or gravel or a layer of sand or gravel that is up to 12 percent silty fines. This material must be at least 3 feet thick and less than 50 percent, by weight, large stones. All other soils are rated as an improbable source. Coarse fragments of soft bedrock, such as shale and siltstone, are not considered to be sand and gravel.

Topsoil is used to cover an area so that vegetation can be established and maintained. The upper 40 inches of a soil is evaluated for use as topsoil. Also evaluated is the reclamation potential of the borrow area.

Plant growth is affected by toxic material and by such properties as soil reaction, available water capacity, and fertility. The ease of excavating, loading, and spreading is affected by rock fragments, slope, a water table, soil texture, and thickness of suitable material. Reclamation of the borrow area is affected by slope, a water table, rock fragments, bedrock, and toxic material.

Soils rated *good* have friable loamy material to a depth of at least 40 inches. They are free of stones and cobbles, have little or no gravel, and have slopes of less than 8 percent. They are low in content of soluble salts, are naturally fertile or respond well to fertilizer, and are not so wet that excavation is difficult.

Soils rated *fair* are sandy soils, loamy soils that have a relatively high content of clay, soils that have only 20 to 40 inches of suitable material, soils that have an appreciable amount of gravel, stones, or soluble salts, or soils that have slopes of 8 to 15 percent. The soils are not so wet that excavation is difficult.

Soils rated *poor* are very sandy or clayey, have less than 20 inches of suitable material, have a large amount of gravel, stones, or soluble salts, have slopes of more than 15 percent, or have a seasonal water table at or near the surface.

The surface layer of most soils is generally preferred for topsoil because of its organic matter content. Organic matter greatly increases the absorption and retention of moisture and nutrients for plant growth.

water management

Table 15 gives information on the soil properties and site features that affect water management. The degree and kind of soil limitations are given for pond reservoir areas; embankments, dikes, and levees; and aquifer-fed ponds. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and are easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increase in construction costs, and possibly increased maintenance are required.

This table also gives for each soil the restrictive features that affect drainage, terraces and diversions, and grassed waterways.

Pond reservoir areas hold water behind a dam or embankment. Soils best suited to this use have low seepage potential in the upper 60 inches. The seepage potential is determined by the permeability of the soil and the depth to fractured bedrock or other permeable material. Excessive slope can affect the storage capacity of the reservoir area.

Embankments, dikes, and levees are raised structures of soil material, generally less than 20 feet high, constructed to impound water or to protect land against overflow. In this table, the soils are rated as a source of material for embankment fill. The ratings apply to the soil material below the surface layer to a depth of about 5 feet. It is assumed that soil layers will be uniformly mixed and compacted during construction.

The ratings do not indicate the ability of the natural soil to support an embankment. Soil properties to a depth even greater than the height of the embankment can affect performance and safety of the embankment. Generally, deeper onsite investigation is needed to determine these properties.

Soil material in embankments must be resistant to seepage, piping, and erosion and have favorable compaction characteristics. Unfavorable features include less than 5 feet of suitable material and a high content of stones or boulders, organic matter, or salts or sodium. A high water table affects the amount of usable material. It also affects trafficability.

Aquifer-fed excavated ponds are pits or dugouts that extend to a ground-water aquifer or to a depth below a permanent water table. Excluded are ponds that are fed only by surface runoff and embankment ponds that impound water 3 feet or more above the original surface. Excavated ponds are affected by depth to a permanent water table, permeability of the aquifer, and quality of the water as inferred from the salinity of the soil. Depth to bedrock and the content of large stones affect the ease of excavation.

Drainage is the removal of excess surface and subsurface water from the soil. How easily and effectively the soil is drained depends on the depth to bedrock, to a cemented pan, or to other layers that affect the rate of water movement; permeability; depth to a high water table or depth of standing water if the soil is subject to ponding; slope; susceptibility to flooding; subsidence of organic layers; and potential frost action. Excavating and grading and the stability of ditchbanks are affected by depth to bedrock or to a cemented pan, large stones, slope, and the hazard of cutbanks caving. The productivity of the soil after drainage is adversely affected by extreme acidity or by toxic substances in the root zone, such as salts, sodium, or sulfur. Availability of drainage outlets is not considered in the ratings.

Terraces and diversions are embankments or a combination of channels and ridges constructed across a slope to reduce erosion and conserve moisture by intercepting runoff. Slope, wetness, large stones, and depth to bedrock or to a cemented pan affect the construction of terraces and diversions. A restricted rooting depth, a severe hazard of wind or water erosion, an excessively coarse texture, and restricted permeability adversely affect maintenance.

Grassed waterways are natural or constructed channels, generally broad and shallow, that conduct surface water to outlets at a nonerosive velocity. Large stones, wetness, slope, and depth to bedrock or to a cemented pan affect the construction of grassed waterways. A hazard of wind erosion, low available water capacity, restricted rooting depth, toxic substances, such as salts or sodium, and restricted permeability adversely affect the growth and maintenance of the grass after construction.

soil properties

Data relating to soil properties are collected during the course of the soil survey. The data and the estimates of soil and water features, listed in tables, are explained on the following pages.

Soil properties are determined by field examination of the soils and by laboratory index testing of some benchmark soils. Established standard procedures are followed. During the survey, many shallow borings are made and examined to identify and classify the soils and to delineate them on the soil maps. Samples are taken from some typical profiles and tested in the laboratory to determine grain-size distribution, plasticity, and compaction characteristics.

Estimates of soil properties are based on field examinations, on laboratory tests of samples from the survey area, and on laboratory tests of samples of similar soils in nearby areas. Tests verify field observations, verify properties that cannot be estimated accurately by field observation, and help characterize key soils.

The estimates of soil properties shown in the tables include the range of grain-size distribution and Atterberg limits, the engineering classifications, and the physical and chemical properties of the major layers of each soil. Pertinent soil and water features also are given.

engineering index properties

Table 16 gives estimates of the engineering classification and of the range of index properties for the major layers of each soil in the survey area. Most soils have layers of contrasting properties within the upper 5 or 6 feet.

Depth to the upper and lower boundaries of each layer is indicated. The range in depth and information on other properties of each layer are given for each soil series under "Soil series and their morphology."

Texture is given in the standard terms used by the U.S. Department of Agriculture. These terms are defined according to percentages of sand, silt, and clay in the fraction of the soil that is less than 2 millimeters in diameter. "Loam," for example, is soil that is 7 to 27 percent clay, 28 to 50 percent silt, and less than 52 percent sand. If a soil contains particles coarser than sand, an appropriate modifier is added, for example, "gravelly." Textural terms are defined in the Glossary.

Classification of the soils is determined according to the Unified soil classification system (*2*) and the system adopted by the American Association of State Highway and Transportation Officials (*1*).

The Unified system classifies soils according to properties that affect their use as construction material. Soils are classified according to grain-size distribution of the fraction less than 3 inches in diameter and according to plasticity index, liquid limit, and organic matter content. Sandy and gravelly soils are identified as GW, GP, GM, GC, SW, SP, SM, and SC; silty and clayey soils as ML, CL, OL, MH, CH, and OH; and highly organic soils as Pt. Soils exhibiting engineering properties of two groups can have a dual classification, for example, SP-SM.

The AASHTO system classifies soils according to those properties that affect roadway construction and maintenance. In this system, the fraction of a mineral soil that is less than 3 inches in diameter is classified in one of seven groups from A-1 through A-7 on the basis of grain-size distribution, liquid limit, and plasticity index. Soils in group A-1 are coarse grained and low in content of fines (silt and clay). At the other extreme, soils in group A-7 are fine grained. Highly organic soils are classified in group A-8 on the basis of visual inspection.

If laboratory data are available, the A-1, A-2, and A-7 groups are further classified as A-1-a, A-1-b, A-2-4, A-2-5, A-2-6, A-2-7, A-7-5, or A-7-6.

Rock fragments larger than 3 inches in diameter are indicated as a percentage of the total soil on a dry-weight basis. The percentages are estimates determined mainly by converting volume percentage in the field to weight percentage.

Percentage (of soil particles) passing designated sieves is the percentage of the soil fraction less than 3 inches in diameter based on an oven-dry weight. The sieves, numbers 4, 10, 40, and 200 (USA Standard Series), have openings of 4.76, 2.00, 0.420, and 0.074 millimeters, respectively. Estimates are based on laboratory tests of soils sampled in the survey area and in nearby areas and on estimates made in the field.

Liquid limit and *plasticity index* (Atterberg limits) indicate the plasticity characteristics of a soil. The estimates are based on test data from the survey area or from nearby areas and on field examination.

physical and chemical properties

Table 17 shows estimates of some characteristics and features that affect soil behavior. These estimates are

given for the major layers of each soil in the survey area. The estimates are based on field observations and on test data for these and similar soils.

Clay as a soil separate consists of mineral soil particles that are less than 0.002 millimeter in diameter. In this table, the estimated clay content of each major soil layer is given as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

The amount and kind of clay greatly affect the fertility and physical condition of the soil. They determine the ability of the soil to adsorb cations and to retain moisture. They influence shrink-swell potential, permeability, and plasticity, the ease of soil dispersion, and other soil properties. The amount and kind of clay in a soil also affect tillage and earth-moving operations.

Moist bulk density is the weight of soil (ovendry) per unit volume. Volume is measured when the soil is at field moisture capacity, that is, the moisture content at 1/3 bar moisture tension. Weight is determined after drying the soil at 105 degrees C. In this table, the estimated moist bulk density of each major soil horizon is expressed in grams per cubic centimeter of soil material that is less than 2 millimeters in diameter. Bulk density data are used to compute shrink-swell potential, available water capacity, total pore space, and other soil properties. The moist bulk density of a soil indicates the pore space available for water and roots. A bulk density of more than 1.6 can restrict water storage and root penetration. Moist bulk density is influenced by texture, kind of clay, content of organic matter, and soil structure.

Permeability refers to the ability of a soil to transmit water or air. The estimates indicate the rate of downward movement of water when the soil is saturated. They are based on soil characteristics observed in the field, particularly structure, porosity, and texture. Permeability is considered in the design of soil drainage systems, septic tank absorption fields, and construction where the rate of water movement under saturated conditions affects behavior.

Available water capacity refers to the quantity of water that the soil is capable of storing for use by plants. The capacity for water storage is given in inches of water per inch of soil for each major soil layer. The capacity varies, depending on soil properties that affect the retention of water and the depth of the root zone. The most important properties are the content of organic matter, soil texture, bulk density, and soil structure. Available water capacity is an important factor in the choice of plants or crops to be grown and in the design and management of irrigation systems. Available water capacity is not an estimate of the quantity of water actually available to plants at any given time.

Soil reaction is a measure of acidity or alkalinity and is expressed as a range in pH values. The range in pH of each major horizon is based on many field tests. For many soils, values have been verified by laboratory analyses. Soil reaction is important in selecting crops and other plants, in evaluating soil amendments for fertility and stabilization, and in determining the risk of corrosion.

Salinity is a measure of soluble salts in the soil at saturation. It is expressed as the electrical conductivity of the saturation extract, in millimhos per centimeter at 25 degrees C. Estimates are based on field and laboratory measurements at representative sites of nonirrigated soils. The salinity of irrigated soils is affected by the quality of the irrigation water and by the frequency of water application. Hence, the salinity of soils in individual fields can differ greatly from the value given in the table. Salinity affects the suitability of a soil for crop production, the stability of soil if used as construction material, and the potential of the soil to corrode metal and concrete.

Shrink-swell potential is the potential for volume change in a soil with a loss or gain in moisture. Volume change occurs mainly because of the interaction of clay minerals with water and varies with the amount and type of clay minerals in the soil. The size of the load on the soil and the magnitude of the change in soil moisture content influence the amount of swelling of soils in place. Laboratory measurements of swelling of undisturbed clods were made for many soils. For others, swelling was estimated on the basis of the kind and amount of clay minerals in the soil and on measurements of similar soils.

If the shrink-swell potential is rated moderate to very high, shrinking and swelling can cause damage to buildings, roads, and other structures. Special design is often needed.

Shrink-swell potential classes are based on the change in length of an unconfined clod as moisture content is increased from air-dry to field capacity. The change is based on the soil fraction less than 2 millimeters in diameter. The classes are *low*, a change of less than 3 percent; *moderate*, 3 to 6 percent; and *high*, more than 6 percent. *Very high*, greater than 9 percent, is sometimes used.

Erosion factor K indicates the susceptibility of a soil to sheet and rill erosion by water. Factor K is one of six factors used in the Universal Soil Loss Equation (USLE) to predict the average annual rate of soil loss by sheet and rill erosion in tons per acre per year. The estimates are based primarily on percentage of silt, sand, and organic matter (up to 4 percent) and on soil structure and permeability. Values of K range from 0.05 to 0.69. The higher the value, the more susceptible the soil is to sheet and rill erosion by water.

Erosion factor T is an estimate of the maximum average annual rate of soil erosion by wind or water that can occur without affecting crop productivity over a sustained period. The rate is in tons per acre per year.

Wind erodibility groups are made up of soils that have similar properties affecting their resistance to wind erosion in cultivated areas. The groups indicate the susceptibility of soil to wind erosion and the amount of soil lost. Soils are grouped according to the following distinctions:

1. Sands, coarse sands, fine sands, and very fine sands. These soils are generally not suitable for crops. They are extremely erodible, and vegetation is difficult to establish.
2. Loamy sands, loamy fine sands, and loamy very fine sands. These soils are very highly erodible. Crops can be grown if intensive measures to control wind erosion are used.
3. Sandy loams, coarse sandy loams, fine sandy loams, and very fine sandy loams. These soils are highly erodible. Crops can be grown if intensive measures to control wind erosion are used.

4L. Calcareous loamy soils that are less than 35 percent clay and more than 5 percent finely divided calcium carbonate. These soils are erodible. Crops can be grown if intensive measures to control wind erosion are used.

4. Clays, silty clays, clay loams, and silty clay loams that are more than 35 percent clay. These soils are moderately erodible. Crops can be grown if measures to control wind erosion are used.
5. Loamy soils that are less than 18 percent clay and less than 5 percent finely divided calcium carbonate and sandy clay loams and sandy clays that are less than 5 percent finely divided calcium carbonate. These soils are slightly erodible. Crops can be grown if measures to control wind erosion are used.
6. Loamy soils that are 18 to 35 percent clay and less than 5 percent finely divided calcium carbonate, except silty clay loams. These soils are very slightly erodible. Crops can easily be grown.
7. Silty clay loams that are less than 35 percent clay and less than 5 percent finely divided calcium carbonate. These soils are very slightly erodible. Crops can easily be grown.
8. Stony or gravelly soils and other soils not subject to wind erosion.

Organic matter is the plant and animal residue in the soil at various stages of decomposition.

In table 17, the estimated content of organic matter of the plow layer is expressed as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

The content of organic matter of a soil can be maintained or increased by returning crop residue to the soil. Organic matter affects the available water capacity, infiltration rate, and tilth. It is a source of nitrogen and other nutrients for crops.

soil and water features

Table 18 gives estimates of various soil and water features. The estimates are used in land use planning that involves engineering considerations.

Hydrologic soil groups are used to estimate runoff from precipitation. Soils not protected by vegetation are assigned to one of four groups. They are grouped according to the intake of water when the soils are thoroughly wet and receive precipitation from long-duration storms.

The four hydrologic soil groups are:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a permanent high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

Flooding, the temporary inundation of an area, is caused by overflowing streams or by runoff from adjacent slopes. Water standing for short periods after rainfall or snowmelt and water in swamps and marshes are not considered flooding.

Table 18 gives the frequency and duration of flooding and the time of year when flooding is most likely.

Frequency, duration, and probable dates of occurrence are estimated. Frequency is expressed as none, rare, common, occasional, and frequent. *None* means that flooding is not probable; *rare* that it is unlikely but possible under unusual weather conditions; *common* that it is likely under normal conditions; *occasional* that it occurs on an average of once or less in 2 years; and *frequent* that it occurs on an average of more than once in 2 years. Duration is expressed as *very brief* if less than 2 days, *brief* if 2 to 7 days, and *long* if more than 7 days. Probable dates are expressed in months; November-May, for example, means that flooding can occur during the period November through May.

The information is based on evidence in the soil profile, namely thin strata of gravel, sand, silt, or clay deposited by floodwater; irregular decrease in organic matter content with increasing depth; and absence of distinctive horizons that form in soils that are not subject to flooding.

Also considered is local information about the extent and levels of flooding and the relation of each soil on the landscape to historic floods. Information on the extent of flooding based on soil data is less specific than that provided by detailed engineering surveys that delineate flood-prone areas at specific flood frequency levels.

High water table (seasonal) is the highest level of a saturated zone in the soil in most years. The depth to a seasonal high water table applies to undrained soils. The estimates are based mainly on the evidence of a saturated zone, namely grayish colors or mottles in the soil. Indicated in table 18 are the depth to the seasonal high water table; the kind of water table—that is, perched, artesian, or apparent; and the months of the year that the water table commonly is high. A water table that is seasonally high for less than 1 month is not indicated in table 18.

An apparent water table is a thick zone of free water in the soil. It is indicated by the level at which water stands in an uncased borehole after adequate time is allowed for adjustment in the surrounding soil. An artesian water table is under hydrostatic head, generally beneath an impermeable layer. When this layer is penetrated, the water level rises in an uncased borehole. A perched water table is water standing above an unsaturated zone. In places an upper, or perched, water table is separated from a lower one by a dry zone.

Only saturated zones within a depth of about 6 feet are indicated. A plus sign preceding the range in depth indicates that the water table is above the surface of the soil. The first numeral in the range indicates how high the water rises above the surface. The second numeral indicates the depth below the surface.

Depth to bedrock is given if bedrock is within a depth of 5 feet. The depth is based on many soil borings and on observations during soil mapping. The rock is specified as either soft or hard. If the rock is soft or fractured, excavations generally can be made with trenching machines, backhoes, or small rippers. If the rock is hard or massive, blasting or special equipment generally is needed for excavations.

Potential frost action is the likelihood of upward or lateral expansion of the soil caused by the formation of segregated ice lenses (frost heave) and the subsequent collapse of the soil and loss of strength on thawing. Frost action occurs when moisture moves into the freezing zone of the soil. Temperature, texture, density, permeability, content of organic matter, and depth to the water table are the most important factors considered in evaluating the potential for frost action. It is assumed that the soil is not insulated by vegetation or snow and is not artificially drained. Silty and highly structured clayey soils that have a high water table in winter are most susceptible to frost action. Well drained, very gravelly, or very sandy soils are the least susceptible. Frost heave and low soil strength during thawing cause damage mainly to pavements and other rigid structures.

Risk of corrosion pertains to potential soil-induced electrochemical or chemical action that dissolves or weakens uncoated steel or concrete. The rate of corrosion of uncoated steel is related to such factors as soil moisture, particle-size distribution, acidity, and electrical conductivity of the soil. The rate of corrosion of concrete is based mainly on the sulfate and sodium content, texture, moisture content, and acidity of the soil. Special site examination and design may be needed if the combination of factors creates a severe corrosion environment. The steel in installations that intersect soil boundaries or soil layers is more susceptible to corrosion than steel in installations that are entirely within one kind of soil or within one soil layer.

For uncoated steel, the risk of corrosion, expressed as *low, moderate,* or *high,* is based on soil drainage class, total acidity, electrical resistivity near field capacity, and electrical conductivity of the saturation extract.

For concrete, the risk of corrosion is also expressed as *low*, *moderate*, or *high*. It is based on soil texture, acidity, and amount of sulfates in the saturation extract.

classification of the soils

The system of soil classification used by the National Cooperative Soil Survey has six categories (*5*). Beginning with the broadest, these categories are the order, suborder, great group, subgroup, family, and series. Classification is based on soil properties observed in the field or inferred from those observations or from laboratory measurements. In table 19, the soils of the survey area are classified according to the system. The categories are defined in the following paragraphs.

ORDER. Ten soil orders are recognized. The differences among orders reflect the dominant soil-forming processes and the degree of soil formation. Each order is identified by a word ending in *sols*. An example is Entisols.

SUBORDER. Each order is divided into suborders primarily on the basis of properties that influence soil genesis and are important to plant growth or properties that reflect the most important variables within the orders. The last syllable in the name of a suborder indicates the order. An example is Udalfs (*Ud*, meaning humid, plus *alfs*, from Alfisols).

GREAT GROUP. Each suborder is divided into great groups on the basis of close similarities in kind, arrangement, and degree of development of pedogenic horizons; soil moisture and temperature regimes; and base status. Each great group is identified by the name of a suborder and by a prefix that indicates a property of the soil. An example is Hapludalfs (*Hapl*, meaning minimal horizonation, plus *udlafs*, the suborder of the Alfisols that have a udic moisture regime).

SUBGROUP. Each great group has a typic subgroup. Other subgroups are intergrades or extragrades. The typic is the central concept of the great group; it is not necessarily the most extensive. Intergrades are transitions to other orders, suborders, or great groups. Extragrades have some properties that are not representative of the great group but do not indicate transitions to any other known kind of soil. Each subgroup is identified by one or more adjectives preceding the name of the great group. The adjective *Typic* identifies the subgroup that typifies the great group. An example is Typic Hapludalfs.

FAMILY. Families are established within a subgroup on the basis of physical and chemical properties and other characteristics that affect management. Mostly the properties are those of horizons below plow depth where there is much biological activity. Among the properties and characteristics considered are particle-size class, mineral content, temperature regime, depth of the root zone, consistence, moisture equivalent, slope, and permanent cracks. A family name consists of the name of a subgroup preceded by terms that indicate soil properties. An example is fine-loamy, mixed, mesic Typic Hapludalfs.

SERIES. The series consists of soils that have similar horizons in their profile. The horizons are similar in color, texture, structure, reaction, consistence, mineral and chemical composition, and arrangement in the profile. The texture of the surface layer or of the substratum can differ within a series.

soil series and their morphology

In this section, each soil series recognized in the survey area is described. The descriptions are arranged in alphabetic order.

Characteristics of the soil and the material in which it formed are identified for each series. The soil is compared with similar soils and with nearby soils of other series. A pedon, a small three-dimensional area of soil, that is typical of the series in the survey area is described. The detailed description of each soil horizon follows standards in the Soil Survey Manual (*4*). Many of the technical terms used in the descriptions are defined in Soil Taxonomy (*5*). Unless otherwise stated, colors in the descriptions are for moist soil. Following the pedon description is the range of important characteristics of the soils in the series.

The map units of each soil series are described in the section "Detailed soil map units."

Alford series

The Alford series consists of deep, well drained, moderately permeable soils on uplands. These soils formed in loess. Slopes range from 0 to 12 percent.

Alford soils are similar to Grayford and Russell soils and are adjacent to Cincinnati, Grayford, and Hickory soils on the landscape. The Grayford and Russell soils have more sand and clay in the lower part of the solum. The Cincinnati soils have a fragipan and are in lower positions on the landscape than the Alford soils. Hickory soils have more sand and clay and are in steeper positions on the landscape, adjacent to the Alford soils.

Typical pedon of Alford silt loam, 2 to 6 percent slopes, in a pasture, 790 feet west and 190 feet south of the northeast corner of sec. 36, T. 11 N., R. 2 W.

Ap—0 to 8 inches; brown (10YR 4/3) silt loam, pale brown (10YR 6/3) dry; moderate medium granular structure; friable; many fine roots; neutral; abrupt smooth boundary.
B1t—8 to 15 inches; yellowish brown (10YR 5/6) silt loam; moderate medium subangular blocky structure; firm; many fine roots; thin patchy dark brown (7.5YR 4/4) clay films on faces of peds; slightly acid; clear wavy boundary.
B21t—15 to 26 inches; strong brown (7.5YR 4/5) silty clay loam; strong coarse subangular blocky structure; firm; common fine roots; thin continuous reddish brown (5YR 4/4) clay films on faces of peds; medium acid; clear wavy boundary.
B22t—26 to 40 inches; strong brown (7.5YR 5/6) silty clay loam; strong medium subangular structure; firm; common fine roots; thin continuous reddish brown (5YR 4/4) clay films on faces of peds; medium acid; clear wavy boundary.
B31t—40 to 55 inches; strong brown (7.5YR 5/6) silt loam; moderate medium subangular blocky structure; firm; few fine roots; thin discontinuous dark brown (7.5YR 4/4) clay films on faces of peds; medium acid; clear wavy boundary.
B32—55 to 70 inches; strong brown (7.5YR 5/6) silt loam; weak very coarse subangular blocky structure; friable; few fine roots; medium acid.

The solum is 60 to 80 or more inches thick.

The A horizon has hue of 10YR, value of 4 or 5, and chroma of 2 to 4. The B2t horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 4 to 6. It is silty clay loam or silt loam.

Armiesburg series

The Armiesburg series consists of deep, well drained, moderately permeable soils on broad flood plains. These soils formed in silty alluvium. Slopes range from 0 to 2 percent.

Armiesburg soils are similar to Genesee and Ross soils and are adjacent to Shoals soils on the landscape. Genesee soils do not have a mollic surface layer and have more sand. Ross soils have a thicker dark colored surface layer and more sand. Shoals soils do not have a mollic surface layer, have mottles higher in the profile, and are in a lower position on the landscape.

Typical pedon of Armiesburg silty clay loam, in a cultivated field, 1,780 feet east and 2,045 feet south of the northwest corner of sec. 14, T. 11 N., R. 1 W.

Ap—0 to 8 inches; dark brown (10YR 3/3) silty clay loam, brown (10YR 5/3) dry; moderate medium granular structure; friable; many fine roots; neutral; abrupt smooth boundary.
A12—8 to 15 inches; very dark grayish brown (10YR 3/2) silty clay loam, brown (10YR 4/3) dry; moderate fine and medium granular structure; friable; many fine roots; neutral; clear smooth boundary.
B21—15 to 23 inches; dark brown (10YR 3/3) silty clay loam, yellowish brown (10YR 5/4) dry; moderate fine angular blocky structure; firm; common fine roots; thin discontinuous very dark grayish brown (10YR 3/2) organic coatings on faces of peds; neutral; clear smooth boundary.
B22—23 to 42 inches; brown (10YR 4/3) silty clay loam; moderate medium angular blocky structure; firm; common fine roots; thin continuous very dark grayish brown (10YR 3/2) organic coatings on faces of peds; neutral; clear smooth boundary.
B3—42 to 50 inches; dark yellowish brown (10YR 4/4) silty clay loam; moderate medium subangular blocky structure; friable; few fine roots; thin patchy dark brown (10YR 3/3) organic coatings on faces of peds; neutral; clear smooth boundary.
C—50 to 60 inches; yellowish brown (10YR 5/4) silty clay loam; massive; friable; few fine roots; thin patchy dark yellowish brown (10YR 4/4) organic coatings in old root channels; mildly alkaline.

The solum is 30 to 50 inches thick. It is slightly acid or neutral.

The A horizon has hue of 10YR, value of 3, and chroma of 2 or 3. The B horizon has hue of 10YR, value of 3 to 5, and chroma of 3 or 4. Organic coatings have hue of 10YR, value of 3 or 4, and chroma of 1 to 4. The C horizon has hue of 10YR, value of 4 to 6, and chroma of 3 to 4. It is silt loam or silty clay loam. In some pedons strata of loam, sandy loam, or fine sand are below a depth of 50 inches.

Ava series

The Ava series consists of deep, moderately well drained, very slowly permeable soils on uplands.

These soils formed in loess and the underlying glacial till. Slopes range from 2 to 6 percent.

Ava soils are similar to Cincinnati and Zanesville soils and commonly are adjacent to Hickory and Vigo soils on the landscape. Cincinnati soils do not have mottles in the upper part of the argillic horizon. Zanesville soils do not have mottles in the upper part of the argillic horizon, and their underlying material formed in sandstone residuum. Hickory soils do not have a fragipan, have more sand in the argillic horizon, and are steeper. Vigo soils have mottles closer to the surface, do not have a fragipan, and are on flatter, lower landforms.

Typical pedon of Ava silt loam, 2 to 6 percent slopes, in a pasture, 1,650 feet north and 1,190 feet east of the southwest corner of sec. 35, T. 11 N., R. 2 E.

Ap—0 to 8 inches; dark brown (10YR 4/3) silt loam, light gray (10YR 7/2) dry; weak medium granular

structure; friable; common fine roots; few fine very dark brown (10YR 2/2) iron and manganese oxide accumulations; slightly acid; abrupt smooth boundary.

A2—8 to 14 inches; pale brown (10YR 6/3) silt loam; weak medium platy structure; friable; few fine roots; few fine very dark brown (10YR 2/2) iron and manganese oxide accumulations; slightly acid; clear smooth boundary.

B2t—14 to 23 inches; yellowish brown (10YR 5/6) silt loam; few fine faint pale brown (10YR 6/3) mottles; weak and moderate medium subangular blocky structure; firm; few fine roots; thin discontinuous yellowish brown (10YR 5/4) clay films on faces of peds; thin patchy pale brown (10YR 6/3) silt coatings; very strongly acid; clear wavy boundary.

B&A—23 to 29 inches; yellowish brown (10YR 5/4) silt loam (B part) and light brownish gray (10YR 6/2) silt loam (A part); moderate medium subangular blocky structure; firm; thin patchy brown (10YR 5/3) clay films on faces of peds; few fine roots along cleavage faces; very strongly acid; clear wavy boundary.

Bx1—29 to 45 inches; yellowish brown (10YR 5/4) silty clay loam; weak very coarse prismatic structure parting to weak medium subangular blocky; firm and brittle; thin patchy dark yellowish brown (10YR 4/4) clay films on faces of peds; thick continuous light brownish gray (10YR 6/2) silt coatings; very strongly acid; clear wavy boundary.

IIBx2—45 to 62 inches; yellowish brown (10YR 5/4) silt loam; weak very coarse prismatic structure parting to weak fine and medium subangular; firm and brittle; thin patchy dark yellowish brown (10YR 4/4) clay films on faces of peds; thick continuous light brownish gray (10YR 6/2) silt coatings; few yellowish red (5YR 5/8) iron streaks; very strongly acid; clear smooth boundary.

IIB31—62 to 80 inches; yellowish brown (10YR 5/4) clay loam; few fine distinct light gray (10YR 7/2) mottles; weak coarse subangular blocky structure; firm; thin patchy light brownish gray (10YR 6/2) silt coatings; few fine very dark brown (10YR 2/2) iron and manganese oxide accumulations; slightly acid.

The solum is 60 to 100 inches thick.

The Ap horizon has hue of 10YR, value of 4 to 7, and chroma of 2 or 3. The A2 horizon has hue of 10YR, value of 5 or 6, and chroma of 3 or 4. Some pedons do not have an A2 horizon. The B2t horizon has hue of 10YR or 7.5YR, value of 4 to 6, and chroma of 4 to 6 in the upper part and chroma of 2 or 3 in the lower part. The IIB horizon is clay loam, loam, or silt loam.

Banlic series

The Banlic series consists of deep, somewhat poorly drained, slowly permeable soils on very low terraces. These soils formed in alluvium of mixed origin. Slopes range from 0 to 2 percent.

Banlic soils are similar to Bartle and Wakeland soils and are adjacent to Wakeland and Wilbur soils on the landscape. Bartle soils have a strongly developed fragipan. Wakeland and Wilbur soils are less acid and are on bottom lands.

Typical pedon of Banlic silt loam, in a pasture, 990 feet west and 1,190 feet north of the southeast corner of sec. 24, T. 11 N., R. 1 E.

Ap—0 to 7 inches; grayish brown (10YR 5/2) silt loam, light gray (10YR 7/2) dry; common medium distinct gray (10YR 6/1) and few fine distinct yellowish brown (10YR 5/6) mottles; weak medium granular structure; friable; many fine roots; medium acid; abrupt smooth boundary.

A2—7 to 13 inches; brown (10YR 5/3) silt loam, pale brown (10YR 6/3) dry; few fine distinct light gray (10YR 7/1) and few medium distinct yellowish brown (10YR 5/6) mottles; weak medium granular structure; friable; many fine roots; few fine black (10YR 2/1) iron and manganese oxide accumulations; strongly acid; gradual smooth boundary.

B1—13 to 18 inches; pale brown (10YR 6/3) silt loam; common medium distinct yellowish brown (10YR 5/6) and few medium distinct light gray (10YR 7/1) mottles; moderate medium subangular blocky structure; firm; common fine roots; thick discontinuous gray (10YR 6/1) silt coatings on faces of peds; few fine black (10YR 2/1) iron and manganese oxide accumulations; strongly acid; clear smooth boundary.

B2t—18 to 22 inches; light yellowish brown (10YR 6/4) silt loam; common medium distinct yellowish brown (10YR 5/8) and strong brown (7.5YR 5/6) and few fine distinct light gray (10YR 7/1) mottles; moderate medium subangular blocky structure; firm; common fine roots; thick continuous gray (10YR 5/1) silt and clay films on faces of peds and thin discontinuous white (10YR 8/1) uncoated silt grains covering faces of peds; few fine black (10YR 2/1) iron and manganese oxide accumulations; strongly acid; clear smooth boundary.

Bx1—22 to 34 inches; pale brown (10YR 6/3) silt loam; common medium distinct yellowish brown (10YR 5/6) and light gray (10YR 7/1) mottles; weak coarse prismatic structure parting to moderate medium subangular blocky; firm and slightly brittle; few fine roots; few vesicular pores; thick continuous gray (10YR 6/1) silt coatings on faces of peds; few fine black (10YR 2/1) iron and manganese oxide accumulations; very strongly acid; clear smooth boundary.

Bx2—34 to 41 inches; light yellowish brown (10YR 6/4) silt loam; common medium distinct yellowish brown (10YR 5/6) and few fine faint light brownish gray

(10YR 6/2) mottles; weak coarse prismatic structure; firm and brittle; few fine roots; common vesicular pores; thick continuous gray (10YR 6/1) silt coatings and thin patchy white (10YR 8/1) uncoated silt grains on faces of peds; common fine black (10YR 2/1) iron and manganese oxide accumulations; very strongly acid; clear smooth boundary.

Bx3—41 to 56 inches; pale brown (10YR 6/3) silt loam; common medium distinct yellowish brown (10YR 5/6) and few fine faint light brownish gray (10YR 6/2) mottles; weak coarse prismatic structure parting to weak medium subangular blocky; firm and slightly brittle; few fine roots; few vesicular pores; thick continuous gray (10YR 6/1) silt coatings and thin patchy white (10YR 8/1) bleached silt grains on faces of peds; few fine black (10YR 2/1) iron and manganese oxide accumulations; strongly acid; clear smooth boundary.

B3—56 to 62 inches; light brownish gray (10YR 6/2) silt loam; common medium distinct yellowish brown (10YR 5/6) and few medium distinct dark brown (7.5YR 4/4) mottles; weak coarse prismatic structure; firm; few fine roots; thick discontinuous gray (10YR 6/1) silt coatings on faces of peds; medium acid; clear wavy boundary.

C—62 to 70 inches; pale brown (10YR 6/3) silt loam; many coarse distinct yellowish brown (10YR 5/8) and common coarse prominent dark brown (7.5YR 4/4) mottles; massive; friable; thin discontinuous gray (10YR 6/1) silt coatings in old root channels; slightly acid.

The solum is 45 to 65 inches thick.

The Ap horizon has hue of 10YR, value of 4 to 6, and chroma of 2. The A2 horizon has hue of 10YR, value of 5 or 6, and chroma of 2 or 3. The B2 horizon has hue of 10YR, value of 5 to 7, and chroma of 2 to 4. The Bx horizon has hue of 10YR or 2.5Y, value of 5 or 6, and chroma of 2 to 4. It is silt loam or silty clay loam. The C horizon has hue of 10YR or 2.5Y, value of 5 to 7, and chroma of 1 to 4. It is silt loam or silty clay loam. Some pedons have thin lenses of fine sand.

Bartle series

The Bartle series consists of deep, somewhat poorly drained, very slowly permeable soils on broad, low-lying terraces. These soils formed in silty alluvium of mixed origin. Slopes range from 0 to 2 percent.

Bartle soils are similar to Banlic soils and are adjacent to Pekin, Wakeland, and Wilbur soils on the landscape. Banlic soils do not have a fragipan. Pekin soils do not have mottles in the upper part of the argillic horizon. Wakeland and Wilbur soils do not have a fragipan and are on bottom lands.

Typical pedon of Bartle silt loam, in a cultivated field, 795 feet south and 365 feet west of the northeast corner of sec. 24, T. 11 N., R. 1 E.

Ap—0 to 7 inches; brown (10YR 4/3) silt loam, pale brown (10YR 6/3) dry; many fine distinct gray (10YR 6/1) and common fine distinct yellowish brown (10YR 5/6) mottles; weak medium granular structure; friable; common fine roots; few iron and manganese oxide accumulations; slightly acid; abrupt smooth boundary.

A2—7 to 12 inches; light yellowish brown (10YR 6/4) silt loam; many fine and medium distinct gray (5Y 5/1) and few fine distinct light gray (10YR 7/1) and yellowish brown (10YR 5/6) mottles; weak medium granular structure; friable; common fine roots; strongly acid; clear smooth boundary.

B1t—12 to 18 inches; light yellowish brown (10YR 6/4) silt loam; many medium faint yellowish brown (10YR 5/6) and common medium distinct light gray (5Y 7/1) mottles; weak medium subangular blocky structure, friable; few fine roots; thin patchy yellowish brown (10YR 5/4) clay films on faces of peds; strongly acid; clear smooth boundary.

B2t—18 to 26 inches; light yellowish brown (10YR 6/4) silt loam; many medium faint yellowish brown (10YR 5/6) mottles; moderate fine and medium subangular blocky structure; friable; thick continuous gray (10YR 6/1) and light gray (10YR 7/1) silt and clay films on faces of some peds; strongly acid; clear smooth boundary.

Bx1g—26 to 35 inches; mottled light yellowish brown (10YR 6/4) and light brownish gray (10YR 6/2) silt loam; very coarse prismatic structure parting to weak thin and medium platy; very firm and brittle; thin discontinuous gray (10YR 6/1) silt coatings on faces of peds; many fine pores; very strongly acid; clear smooth boundary.

Bx2g—35 to 57 inches; light brownish gray (10YR 6/2) silt loam; many coarse distinct strong brown (7.5YR 5/6) and few medium faint light gray (10YR 7/1) mottles; moderate very coarse prismatic structure; very firm and brittle; thick continuous light gray (5Y 7/1) silt and clay films on faces of peds; very strongly acid; clear smooth boundary.

Cg—57 to 60 inches; light gray (10YR 6/1) silt loam; many coarse distinct yellowish brown (10YR 5/6) mottles; massive; friable; common coarse dark reddish brown (5YR 3/2) iron and manganese oxide accumulations; medium acid.

The solum is 42 to 60 inches thick.

The Ap horizon has hue of 10YR, value of 4 or 5, and chroma of 2 or 3. The A2 horizon has hue of 10YR, value of 5 or 6, and chroma of 3 or 4. The B2t horizon has hue of 10YR, value of 5 or 6, and chroma of 1 to 4. It is silt loam or silty clay loam. The Bx horizon has hue of 10YR or 2.5Y, value of 5 to 7, and chroma of 1 to 4. It is silt loam or silty clay loam in the upper part. In some pedons the lower part is clay loam or loam. The C horizon has hue of 10YR or 2.5Y, value of 5 or 6, and chroma of 1 to 3. It is silt loam or silty clay loam.

Bedford series

The Bedford series consists of deep, moderately well drained soils on uplands. These soils are moderately permeable in the upper part of the subsoil and very slowly permeable in the fragipan. They formed in loess and in residuum of limestone. Slopes range from 2 to 12 percent. The base status below the fragipan is higher than the limit defined for the series. However, this difference does not affect the use and management of the soils.

Bedford soils are similar to Cincinnati and Zanesville soils and are adjacent to Alford and Cincinnati soils on the landscape. Cincinnati and Zanesville soils have less clay in the lower part of the solum. Alford soils do not have a fragipan, have less clay in the lower part of the solum, and are in lower positions on the landscape.

Typical pedon of Bedford silt loam, 2 to 6 percent slopes, in a pasture, 400 feet west and 725 feet north of the southeast corner of sec. 31, T. 11 N., R. 1 W.

Ap—0 to 7 inches; brown (10YR 4/3) silt loam, light yellowish brown (10YR 6/4) dry; moderate medium granular structure; friable; many fine roots; slightly acid; abrupt smooth boundary.

B21t—7 to 12 inches; yellowish brown (10YR 5/6) silt loam; weak medium subangular blocky structure; firm; many fine roots; thin patchy brown (7.5YR 5/4) clay films on faces of peds; few fine very dark brown (10YR 2/2) iron and manganese oxide accumulations; neutral; clear wavy boundary.

B22t—12 to 17 inches; strong brown (7.5YR 5/6) silty clay loam; moderate medium subangular blocky structure; firm; common fine roots; thin patchy dark brown (7.5YR 4/4) clay films and pale brown (10YR 6/3) silt firms on faces of peds; few fine very dark brown (10YR 2/2) iron and manganese oxide accumulations; medium acid; clear wavy boundary.

B23t—17 to 27 inches; yellowish brown (10YR 5/6) silty clay loam; common fine distinct light gray (10YR 6/1) mottles; moderate medium subangular blocky structure; firm; common fine roots; thin discontinuous dark brown (7.5YR 6/4) clay films and light yellowish gray (10YR 6/3) silt films on faces of peds; few fine very dark brown (10YR 2/2) iron and manganese oxide accumulations; strongly acid; clear irregular boundary.

Bx1—27 to 38 inches; yellowish brown (10YR 5/6) silty clay loam; few fine distinct light brownish gray (10YR 6/2) mottles; weak coarse prismatic structure parting to moderate medium subangular blocky; very firm and slightly brittle; few fine roots; common fine pores; thin discontinuous dark brown (7.5YR 4/2) clay films and thin discontinuous distinct pale brown (10YR 6/3) silt films on faces of peds; strongly acid; clear irregular boundary.

Bx2—38 to 49 inches; yellowish brown (10YR 5/6) silty clay loam; few fine distinct light brownish gray (10YR 6/2) mottles; weak very coarse prismatic structure parting to weak coarse subangular blocky; very firm; brittle; few fine roots on faces of peds; common fine pores; thin discontinuous dark brown (7.5YR 4/4) clay films and thin continuous brown (7.5YR 5/2) silt films on faces of peds; common medium very dark brown (10YR 2/2) iron and manganese oxide accumulations; very strongly acid; clear smooth boundary.

IIB2t—49 to 55 inches; yellowish red (5YR 5/6) silty clay; few fine distinct light brownish gray (10YR 6/2) mottles; moderate medium subangular blocky structure; firm; few fine roots; stone line that is 40 percent coarse fragments; thin patchy brown (7.5YR 4/4) clay films and thin continuous light brownish gray (10YR 6/2) silt films on faces of peds; many medium very dark brown (10YR 6/2) iron and manganese oxide accumulations; very strongly acid; clear wavy boundary.

IIB3—55 to 80 inches; red (2.5YR 4/6) clay; moderate fine angular blocky structure; firm; very strongly acid.

The solum is 48 to 84 inches thick. The depth to limestone bedrock ranges from 5 to 10 feet.

The A horizon has hue of 10YR, value of 3 to 5, and chroma of 2 or 3. The B2t horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 4 to 6. The Bx horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 4 to 6. The IIB horizon has hue of 7.5YR, 5YR, or 2.5YR, value of 4 or 5, and chroma of 4 to 6. It is 2 to 45 percent coarse fragments.

Berks series

The Berks series consists of moderately deep, well drained, moderately permeable soils on uplands. These soils formed in residuum of sandstone and shale bedrock. Slopes range from 35 to 80 percent.

Berks soils are similar to Weikert soils and are adjacent to Gilpin, Weikert, and Wellston soils on the landscape. Weikert soils are shallow. Gilpin and Wellson soils have fewer coarse fragments and are in higher positions on the landscape.

Typical pedon of Berks channery silt loam, 35 to 80 percent slopes, in woodland, 2,245 feet east and 2,375 feet south of the northwest corner of sec. 29, T. 11 N., R. 1 E.

O1—1 inch to 0; decomposed and undecomposed leaf litter.

A11—0 to 3 inches; very dark grayish brown (10YR 3/2) channery silt loam, pale brown (10YR 6/3) dry; weak medium granular structure; friable; many medium and coarse roots; 15 percent coarse fragments; medium acid; abrupt wavy boundary.

A12—3 to 6 inches; brown (10YR 4/3) channery silt loam; weak medium granular structure; friable; many medium and coarse roots; 15 percent coarse fragments; medium acid; clear wavy boundary.

B21—6 to 12 inches; dark yellowish brown (10YR 4/4) channery loam; weak medium subangular blocky structure; friable; slightly plastic; common fine roots; 30 percent coarse fragments; strongly acid; clear wavy boundary.
B22—12 to 17 inches; yellowish brown (10YR 5/4) very channery loam; weak medium subangular blocky structure; friable; slightly sticky; common fine roots; 50 percent coarse fragments; strongly acid; clear wavy boundary.
B3—17 to 24 inches; strong brown (7.5YR 5/6) very channery loam; weak medium subangular blocky structure; friable; few fine roots; 70 percent coarse fragments; very strongly acid; clear wavy boundary.
C—24 to 30 inches; yellowish brown (10YR 5/6) very channery loam; massive; friable; 80 percent coarse fragments; very strongly acid; abrupt wavy boundary.
R—30 inches; fractured sandstone bedrock.

The solum typically is 20 to 30 inches thick. However, it ranges from 18 to 35 inches in thickness. Depth to bedrock ranges from 20 to 40 inches.

The A1 horizon has hue of 10YR, value of 3 or 4, and chroma of 2 or 3. It commonly is channery silt loam or very channery loam. The B2 horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 4 to 6. It commonly is channery loam or very channery loam but ranges to channery silt loam or very channery silt loam.

Bloomfield series

The Bloomfield series consists of deep, somewhat excessively drained, rapidly permeable soils on uplands and terraces. These soils formed in sand deposited by wind and water. Slopes range from 6 to 12 percent.

Bloomfield soils are similar to Princeton soils and are adjacent to them on the landscape. The Princeton soils are in similar positions. They have more clay in the solum.

Typical pedon of Bloomfield loamy fine sand, 6 to 12 percent slopes, in a pasture, 2,640 feet east and 330 feet north of the southwest corner of sec. 22, T. 11 N., R. 2 W.

Ap—0 to 5 inches; dark grayish brown (10YR 4/2) loamy fine sand, brown (10YR 5/3) dry; weak fine granular structure; very friable; many fine roots; neutral; abrupt wavy boundary.
A12—5 to 9 inches; brown (10YR 4/3) loamy sand, yellowish brown (10YR 5/4) dry; weak fine and medium granular structure; very friable; common fine roots; neutral; abrupt wavy boundary.
A2—9 to 32 inches; yellowish brown (10YR 5/6) loamy sand; weak fine granular structure; very friable; few fine roots; slightly acid; abrupt wavy boundary.
A&B—32 to 61 inches; A part is yellowish brown (10YR 5/6) loamy sand; single grain; loose to very friable; B part is many discontinuous and continuous dark brown (10YR 4/4) sandy loam lamellae 1/4 to 1 inch thick, combined thickness of 8 inches; weak fine and medium subangular blocky structure; friable; few fine roots; slightly acid; abrupt wavy boundary.
C—61 to 70 inches; brownish yellow (10YR 6/6) sand; loose; neutral.

The solum is 54 to 72 inches thick.

The A horizon has hue of 10YR, value of 3 to 6, and chroma of 2 to 3. It is loamy fine sand, fine sand, or loamy sand. The A2 horizon has hue of 10YR, value of 4 or 5, and chroma of 3 to 6. It is loamy sand, loamy fine sand, or fine sand. The A part of the A&B horizon has hue of 10YR, value of 5 or 6, and chroma of 4 to 6. It is loamy sand or fine sand. The B part of the A&B horizon has hue of 10YR or 7.5YR, value of 3 or 4, and chroma of 3 or 4. It is sandy loam or fine sandy loam. The combined thickness of the lamellae is 6 to 10 inches. The C horizon has hue of 10YR, value of 4 to 6, and chroma of 4 to 6. It is neutral or mildly alkaline.

Bonnie series

The Bonnie series consists of deep, poorly drained, moderately slowly permeable soils on bottom lands. These soils formed in silty acid alluvium. Slopes range from 0 to 2 percent.

Bonnie soils are similar to Wakeland soils and are adjacent to Haymond and Wakeland soils on the landscape. Haymond and Wakeland soils are better drained and are in higher positions on the landscape.

Typical pedon of Bonnie silt loam, in a pasture, 925 feet east and 2,640 feet north of the southwest corner of sec. 15, T. 12 N., R. 2 W.

Ap—0 to 8 inches; grayish brown (10YR 5/2) silt loam, light gray (10YR 7/2) dry; common medium distinct yellowish brown (10YR 5/8) and light gray (10YR 7/1) mottles; weak medium granular structure; friable; many fine roots; common fine distinct very dark brown (10YR 2/2) iron and manganese oxide accumulations; slightly acid; abrupt smooth boundary.
C1g—8 to 37 inches; gray (10YR 6/1) silt loam; common medium distinct yellowish brown (10YR 5/8) mottles; weak coarse prismatic structure parting to weak coarse subangular blocky; friable; few fine roots; thin patchy light gray (10YR 7/1) silt grains on faces of peds; common medium distinct very dark brown (10YR 2/2) iron and manganese oxide accumulations; strongly acid; gradual smooth boundary.
C2g—37 to 51 inches; grayish brown (10YR 5/2) silt loam; many coarse strong brown (7.5YR 5/6) mottles; weak medium subangular blocky structure; friable; few fine roots; thick continuous gray (10YR 5/1) silt coatings on faces of peds; common light gray (10YR 7/1) silt grains in old root channels; medium acid; clear smooth boundary.

C3g—51 to 60 inches; gray (10YR 6/1) silty clay loam; many coarse prominent strong brown (7.5YR 5/6) mottles; weak coarse subangular blocky structure; friable; few fine roots; common light gray (10YR 7/1) silt grains on faces of peds; common medium distinct very dark brown (10YR 2/2) iron and manganese oxide accumulations; medium acid.

The A horizon has hue of 10YR, 2.5Y, or 5Y, value of 4 to 6, and chroma of 1 to 3. The C horizon has hue of 10YR, 2.5Y, or 5Y, value of 5 to 7, and chroma of 1 or 2.

Brookston series

The Brookston series consists of deep, very poorly drained, moderately permeable soils on uplands. These soils formed in glacial till. Slopes range from 0 to 2 percent.

Brookston soils are similar to Rensselaer soils and commonly are adjacent to Crosby and Miami soils on the landscape. The underlying material of the Rensselaer soils is stratified. Crosby soils do not have a mollic epipedon and have more clay in the argillic horizon. Miami soils do not have a mollic epipedon and are well drained. Crosby and Miami soils are in higher positions on the landscape.

Typical pedon of Brookston clay loam, in a hayfield, 2,310 feet west and 265 feet south of the northeast corner of sec. 12, T. 13 N., R. 2 W.

Ap—0 to 7 inches; very dark gray (10YR 3/1) clay loam, gray (10YR 5/1) dry; moderate medium granular structure; friable; common fine and medium roots; slightly acid; abrupt smooth boundary.

A12—7 to 17 inches; black (10YR 2/1) clay loam, dark gray (10YR 4/1) dry; few fine distinct gray (10YR 5/1) and yellowish brown (10YR 5/4) mottles; weak medium subangular blocky structure parting to moderate medium granular; firm; common fine roots; neutral; clear wavy boundary.

B21tg—17 to 24 inches; gray (10YR 5/1) clay loam; common medium distinct yellowish brown (10YR 5/6) mottles; moderate coarse prismatic structure parting to moderate medium subangular blocky; firm; few fine roots; thick continuous dark gray (10YR 4/1) clay and thin discontinuous black (10YR 2/1) films on faces of peds; neutral; clear wavy boundary.

B22tg—24 to 32 inches; gray (10YR 5/1) clay loam; common medium distinct yellowish brown (10YR 5/6) mottles; moderate coarse prismatic structure parting to moderate medium subangular blocky; firm; few fine roots; thick continuous dark gray (10YR 4/1) clay and silt films on faces of peds; neutral; clear wavy boundary.

B23tg—32 to 36 inches; gray (10YR 5/1) clay loam; few fine distinct yellowish brown (10YR 5/6) mottles; moderate medium subangular blocky structure; firm; few fine roots; thick continuous dark gray (10YR 4/1) clay and silt films on faces of peds; many thin dark gray (10YR 3/1) organic coatings on faces of peds; few pebbles; neutral; clear wavy boundary.

B3t—36 to 49 inches; yellowish brown (10YR 5/6) clay loam; many medium distinct gray (10YR 5/1) mottles; moderate medium subangular blocky structure; firm; thin discontinuous grayish brown (10YR 5/2) silt and clay films on faces of peds; few pebbles; neutral; clear wavy boundary.

C—49 to 60 inches; gray (10YR 5/1) loam; many coarse distinct yellowish brown (10YR 5/6) mottles; massive; firm; strong effervescence; moderately alkaline.

The solum typically is 40 to 55 inches thick.

The A horizon has hue of 10YR, value of 2 or 3, and chroma of 1 or 2. It is clay loam, silty clay loam, or silt loam. The B2t horizon has hue of 10YR, 2.5Y, or 5Y, value of 4 to 6, and chroma of 1 or 2. It is clay loam or silty clay loam. In some pedons the lower subhorizons are loam or sandy clay loam and are as much as 10 percent gravel. The C horizon has hue of 10YR, value of 5 to 7, and chroma of 1 to 5. It is commonly loam but ranges to sandy loam. Gravel content is as much as 10 percent.

Chetwynd series

The Chetwynd series consists of deep, well drained, moderately permeable soils on side slopes of outwash plains and terraces. These soils formed in outwash sediment. Slopes range from 18 to 80 percent.

Chetwynd soils are similar to Martinsville and Ockley soils and are adjacent to Parke and Pike soils on the landscape. Martinsville and Ockley soils are less acid, and their argillic horizon is brown. Parke and Pike soils have more silt in the control section and are in higher, less sloping positions.

Typical pedon of Chetwynd loam, 18 to 80 percent slopes, in woods, 2,375 feet north and 1,385 feet east of the southwest corner of sec. 13, T. 11 N., R. 1 E.

A1—0 to 4 inches; very dark grayish brown (10YR 3/2) loam, light brownish gray (10YR 6/2) dry; weak fine and medium granular structure; friable; many fine and medium roots; few pebbles; neutral; abrupt wavy boundary.

A2—4 to 9 inches; yellowish brown (10YR 5/4) loam; weak thin and medium platy structure parting to moderate fine granular; friable; common fine to coarse roots; few pebbles; slightly acid; clear wavy boundary.

B1t—9 to 13 inches; strong brown (7.5YR 5/6) loam; weak fine and medium subangular blocky structure; firm; common fine roots; thin patchy dark brown (7.5YR 4/4) clay films on faces of peds; few pebbles; strongly acid; clear wavy boundary.

B21t—13 to 25 inches; yellowish red (5YR 5/6) sandy clay loam; moderate medium subangular blocky

structure; firm; common fine roots; thin discontinuous reddish brown (5YR 4/4) clay films on faces of peds; 2 percent gravel; very strongly acid; clear wavy boundary.

B22t—25 to 44 inches; yellowish red (5YR 5/6) sandy clay loam; moderate medium subangular blocky structure; firm; common fine roots; thin continuous reddish brown (5YR 4/4) clay films on faces of peds; thin patchy reddish yellow (7.5YR 6/6) silt flows on faces of some peds; 5 percent gravel; very strongly acid; clear wavy boundary.

B3t—44 to 57 inches; strong brown (7.5YR 5/6) sandy loam; weak medium subangular blocky structure; firm; few fine roots; thin patchy reddish brown (5YR 4/4) clay films on faces of peds; 10 percent gravel; strongly acid; abrupt wavy boundary.

C1—57 to 72 inches; stratified reddish yellow (7.5YR 6/6) loamy sand and yellowish red (5YR 5/6) sandy loam; single grain and massive; loose and very friable; 5 percent gravel; strongly acid; gradual wavy boundary.

C2—72 to 80 inches; stratified brownish yellow (10YR 5/6) sand and strong brown (7.5YR 4/4) sandy loam; single grain and massive; loose and very friable; strongly acid.

The solum typically is 50 to 60 inches thick, although it ranges from 45 to 65 inches in thickness.

The A horizon has hue of 10YR, value of 3 or 4, and chroma of 2 to 4. It is loam, silt loam, or fine sandy loam. The B2t horizon has hue of 10YR, 7.5YR, or 5YR, value of 4 or 5, and chroma of 4 to 6. It is clay loam or sandy clay loam. The C horizon has hue of 10YR or 7.5YR, value of 4 or 6, and chroma of 4 to 6. It is commonly stratified. The strata are sandy loam, sand, loam, sandy clay loam, or gravelly sand. The C horizon is strongly acid or very strongly acid directly below the B horizon and is calcareous below a depth of 8 to 15 feet.

Cincinnati series

The Cincinnati series consists of deep, well drained soils on uplands. These soils are moderately permeable in the upper part of the subsoil and slowly permeable in the fragipan. They formed in loess and in the underlying glacial till. Slopes range from 6 to 18 percent.

Cincinnati soils are similar to Ava and Zanesville soils and are adjacent to Hickory and Vigo soils on the landscape. Ava soils have mottles in the upper part of the argillic horizon. Zanesville soils have a thinner solum. Hickory soils do not have a fragipan and are steeper. Vigo soils do not have a fragipan and their subsoil is grayer. They have mottles higher in the argillic horizon and are less sloping.

Typical pedon of Cincinnati silt loam, 6 to 12 percent slopes, eroded, in a wooded pasture, 1,320 feet east and 2,370 feet north of the southwest corner of sec. 32, T. 11 N., R. 2 E.

Ap—0 to 7 inches; brown (10YR 5/3) silt loam, pale brown (10YR 6/3) dry; weak thin platy structure in the upper part and weak medium subangular blocky structure in the lower part; friable; common fine and medium roots; some strong brown (7.5YR 5/6) soil from the B horizon; strongly acid; abrupt wavy boundary.

B1t—7 to 16 inches; strong brown (7.5YR 5/6) silt loam; weak medium subangular blocky structure; firm; common medium and coarse roots; thin patchy brown (7.5YR 5/4) clay films on faces of peds; very strongly acid; clear wavy boundary.

B2t—16 to 23 inches; yellowish brown (10YR 5/6) silty clay loam; moderate medium subangular blocky structure; firm; common fine roots; thin continuous strong brown (7.5YR 5/6) clay films and thin patchy pale brown (10YR 6/3) silt coatings on faces of peds; very strongly acid; clear wavy boundary.

Bx1—23 to 34 inches; strong brown (7.5YR 5/6) silty clay loam; weak very coarse prismatic structure parting to weak medium subangular blocky; firm and brittle; few fine roots along faces of peds; thin continuous dark brown (7.5YR 4/4) clay films and thin continuous pale brown (10YR 6/3) silt coatings on faces of peds; strongly acid; clear wavy boundary.

IIBx2—34 to 47 inches; yellowish brown (10YR 5/6) clay loam; moderate coarse prismatic structure parting to weak medium subangular blocky; firm and brittle; thin discontinuous dark brown (7.5YR 4/4) clay films and thin discontinuous light gray (10YR 7/2) silt coatings on faces of peds; strongly acid; clear wavy boundary.

IIB21t—47 to 57 inches; strong brown (7.5YR 5/6) clay loam; moderate fine angular blocky structure; firm; thin continuous dark brown (7.5YR 4/4) clay films on faces of peds; medium acid; clear wavy boundary.

IIB22t—57 to 77 inches; yellowish brown (10YR 5/6) clay loam; moderate medium subangular blocky structure; firm; thin continuous dark brown (7.5YR 4/4) clay films on faces of peds; common medium black (10YR 2/1) iron and manganese oxide accumulations; few glacial pebbles; neutral; clear wavy boundary.

IIB3t—77 to 80 inches; brown (7.5YR 5/4) clay loam; weak medium subangular blocky structure; firm; thin patchy reddish brown (5YR 4/4) clay films on faces of peds; common medium black (10YR 2/1) iron and manganese oxide accumulations; 1 percent gravel; mildly alkaline.

The solum typically is 70 to 95 inches thick, although it ranges from 50 to 120 inches in thickness. Depth to the fragipan ranges from 20 to 40 inches.

The Ap horizon has hue of 10YR, value of 4 or 5, and chroma of 2 or 3. The B2t horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 4 to 6. It

commonly is silty clay loam but ranges to silt loam and clay loam. In some pedons a few fine faint mottles are in the lower part of the B2t horizon. The Bx and IIBx horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 4 to 6. It is silty clay loam in the upper part and clay loam or loam in the lower part. It is strongly acid or very strongly acid. The IIB1 horizon has hue of 10YR or 7.5YR, value of 5 or 6, and chroma of 3 to 6. It is clay loam or loam. It is neutral to moderately alkaline.

Crosby series

The Crosby series consists of deep, somewhat poorly drained, slowly permeable soils on uplands. These soils formed in loess and in the underlying glacial till. Slopes range from 0 to 4 percent.

Crosby soils are similar to Whitaker soils and commonly are adjacent to Brookston and Miami soils on the landscape. Whitaker soils have less clay in the argillic horizon, and their substratum is stratified. Brookston soils have a mollic epipedon, and their argillic horizon has less clay. They are in lower positions on the landscape. Miami soils have a brown subsoil, and their argillic horizon has less clay. They are on higher rises.

Typical pedon of Crosby silt loam, 0 to 2 percent slopes, in a cultivated field, 1,900 feet north and 2,500 feet west of the southeast corner of sec. 6, T. 13 N., R. 1 W.

Ap—0 to 8 inches; grayish brown (10YR 5/2) silt loam, very pale brown (10YR 7/3) dry; few fine faint light gray (10YR 7/2) and few fine distinct yellowish brown (10YR 5/6) mottles; weak fine and medium granular structure; friable; few fine roots; few fine very dark brown (10YR 2/2) iron and manganese oxide accumulations; neutral; abrupt smooth boundary.

B21t—8 to 15 inches; pale brown (10YR 6/3) silty clay loam; common coarse distinct yellowish brown (10YR 6/8) and few medium faint light gray (10YR 7/2) mottles; weak coarse prismatic structure parting to moderate medium subangular blocky; firm; few fine roots; thin discontinuous grayish brown (10YR 5/2) clay films on faces of peds; strongly acid; clear wavy boundary.

IIB22t—15 to 23 inches; yellowish brown (10YR 5/6) clay loam; common fine distinct gray (10YR 6/1) mottles; weak coarse prismatic structure parting to moderate medium subangular blocky; firm; few fine roots; medium continuous dark yellowish brown (10YR 4/4) and grayish brown (10YR 5/2) clay and silt coatings on faces of peds; few pebbles; strongly acid; clear wavy boundary.

IIB23t—23 to 30 inches; yellowish brown (10YR 5/6) clay loam; common medium distinct light gray (10YR 7/2) mottles; weak coarse prismatic structure parting to moderate medium subangular blocky; firm; few fine roots; medium discontinuous distinct gray (10YR 5/1) clay films on faces of peds; few medium very dark brown (10YR 2/2) iron and manganese oxide accumulations; medium acid; clear wavy boundary.

IIB24t—30 to 36 inches; yellowish brown (10YR 5/6) clay loam; common medium distinct light brownish gray (10YR 6/2) mottles; weak coarse subangular blocky structure; firm; thin discontinuous distinct dark yellowish brown (10YR 4/4) clay films on faces of peds; common medium very dark brown (10YR 2/2) iron and manganese oxide accumulations; few pebbles; neutral; gradual wavy boundary.

IIC—36 to 60 inches; brown (10YR 5/3) loam; common medium distinct light brownish gray (10YR 6/2) mottles; massive; firm; 3 percent gravel; strong effervescence; moderately alkaline.

The solum typically is 30 to 40 inches thick. The depth to free carbonates is also typically 30 to 40 inches.

The Ap horizon has hue of 10YR, value of 4 or 5, and chroma of 2. The B2t and IIB2t horizons have hue of 10YR, value of 4 to 6, and chroma of 2 to 6. They are silty clay loam or clay loam in the upper part and clay loam or loam in the lower part. The C horizon is brown or yellowish brown.

Elkinsville series

The Elkinsville series consists of deep, well drained, moderately permeable soils on low terraces. These soils formed in strongly acid material derived from glacial drift and in residuum of sandstone and shale. Slopes range from 2 to 12 percent.

Elkinsville soils are similar to Parke soils and are adjacent to Bartle and Pekin soils on the landscape. Bartle soils have a fragipan and mottles near the surface. They are on flatter, lower lying landforms. Parke soils have redder colors in the lower part of the solum. Pekin soils have a fragipan and mottles in the upper part of the argillic horizon.

Typical pedon of Elkinsville silt loam, 6 to 12 percent slopes, eroded, in a pasture, 925 feet west and 450 feet south of the northeast corner of sec. 36, T. 11 N., R. 1 W.

Ap—0 to 5 inches; brown (10YR 4/3) silt loam, light brownish gray (10YR 6/2) dry; moderate medium granular structure; friable; many fine roots; some strong brown (7.5YR 5/6) soil from the B horizon; medium acid; abrupt clear boundary.

B1t—5 to 9 inches; strong brown (7.5YR 5/6) silt loam; weak medium subangular blocky structure; friable; common fine roots; thin patchy distinct reddish brown (2.5YR 4/4) clay films on faces of peds; strongly acid; clear smooth boundary.

B21t—9 to 13 inches; strong brown (7.5YR 5/6) silt loam; moderate medium subangular blocky structure; firm; few fine roots; thin patchy dark brown

(7.5YR 4/4) clay films on faces of peds; very strongly acid; gradual smooth boundary.
B22t—13 to 20 inches; strong brown (7.5YR 5/6) silty clay loam; moderate medium subangular blocky structure; firm; few fine roots; thin discontinuous dark brown (7.5YR 4/4) clay films on faces of peds; very strongly acid; gradual smooth boundary.
B23t—20 to 29 inches; strong brown (7.5YR 5/6) silt loam; moderate medium subangular blocky structure; firm; few fine roots; thin discontinuous dark brown (7.5YR 4/4) clay films and thin patchy light gray (10YR 7/1) silt streaks on faces of peds; very strongly acid; gradual smooth boundary.
B24t—29 to 38 inches; strong brown (7.5YR 5/6) silt loam; moderate medium subangular blocky structure; firm; few fine roots; thin discontinuous light gray (10YR 7/1) silt films on faces of peds; very strongly acid; clear smooth boundary.
B25t—38 to 53 inches; strong brown (7.5YR 5/6) silty clay loam; moderate medium subangular blocky structure; firm; thin patchy dark brown (7.5YR 4/4) clay films on faces of peds; thin discontinuous light brownish gray (10YR 6/2) silt streaks; common medium black (10YR 2/1) iron and manganese oxide accumulations; strongly acid; clear smooth boundary.
B3t—53 to 64 inches; yellowish brown (10YR 5/6) silty clay loam; weak medium subangular blocky structure; friable; thin patchy distinct dark brown (7.5YR 4/4) clay films and thin patchy light gray (10YR 7/1) and light brownish gray (10YR 6/2) silt coatings on faces of peds; common medium black (10YR 2/1) iron and manganese oxide accumulations; strongly acid; clear smooth boundary.
C—64 to 80 inches; yellowish brown (10YR 5/4) silty clay loam; common distinct dark brown (7.5YR 4/4), light gray (10YR 7/1), and light grayish brown (10YR 6/2) mottles; massive; friable; few pebbles; strongly acid.

The solum typically is 45 to 65 inches thick.
The Ap horizon has hue of 10YR, value of 4 or 5, and chroma of 2 to 4. The B2t horizon 10YR or 7.5YR, value of 4 or 5, and chroma of 4 to 6. The C horizon has hue of 10YR, value of 5 or 6, and chroma of 3 or 4.

Evansville series

The Evansville series consists of deep, poorly drained, moderately permeable soils on very low terraces and old lakebeds. These soils formed in stratified silt loam and silty clay loam sediment. Slopes range from 0 to 2 percent.

Evansville soils are similar to Patton and Zipp soils and are adjacent to Shoals soils on the landscape. Patton soils have a mollic epipedon. Zipp soils have more clay. Shoals soils have more sand and are not as gray.

Typical pedon of Evansville silty clay loam, in a cultivated field, 130 feet east and 30 feet south of the northwest corner of sec. 28, T. 13 N., R. 2 W.

Ap—0 to 8 inches; dark grayish brown (10YR 4/2) silty clay loam; pale brown (10YR 6/3) dry; massive; friable; common fine roots; slightly acid; abrupt smooth boundary.
B1g—8 to 15 inches; gray (10YR 5/1) silty clay loam; many medium distinct mottles; weak medium prismatic structure parting to moderate medium subangular blocky; firm; few fine roots; thin patchy dark gray (10YR 4/1) organic coatings on faces of peds; neutral; clear smooth boundary.
B21g—15 to 23 inches; gray (10YR 5/1) silty clay loam; common medium distinct yellowish brown (10YR 5/8) mottles; moderate medium prismatic structure parting to moderate medium subangular blocky; firm; few fine roots; thin discontinuous dark gray (10YR 4/1) organic coatings on faces of peds; neutral; clear smooth boundary.
B22g—23 to 35 inches; grayish brown (10YR 5/2) silty clay loam; common medium distinct yellowish brown (10YR 5/8) mottles; moderate medium prismatic structure parting to moderate medium subangular blocky; firm; few fine roots; thin patchy dark gray (10YR 6/1) organic coatings on faces of peds; neutral; clear smooth boundary.
B23g—35 to 42 inches; grayish brown (10YR 5/2) silty clay loam; many medium distinct yellowish brown (10YR 5/8) mottles; weak medium prismatic structure parting to moderate medium subangular blocky; firm; thin patchy dark gray (10YR 4/1) organic coatings on faces of peds; neutral; clear smooth boundary.
B3g—42 to 50 inches; grayish brown (10YR 5/2) silty clay loam; many coarse distinct yellowish brown (10YR 5/8) mottles; weak medium subangular blocky structure; firm; thin patchy dark gray (10YR 4/1) organic coatings on faces of peds; neutral; abrupt smooth boundary.
C—50 to 60 inches; yellowish brown (10YR 5/4) stratified silt loam and silty clay loam; many coarse distinct strong brown (7.5YR 5/6) mottles; massive; firm; neutral.

The solum typically is 30 to 50 inches thick.
The A horizon has hue of 10YR, value of 3 to 5, and chroma of 2. It is silty clay loam or silt loam. The B2g horizon has hue of 10YR, 2.5Y, or 5Y, value of 4 or 5, and chroma of 1 or 2. It commonly is silty clay loam but ranges to silt loam. The C horizon is silty clay loam or silt loam. Lenses of sandy loam or loam are in some pedons.

Fincastle series

The Fincastle series consists of deep, somewhat poorly drained soils on uplands. These soils are

moderately slowly permeable in the subsoil and slowly permeable in the underlying material. They formed in loess and in the underlying glacial till. Slopes range from 0 to 3 percent.

Fincastle soils are similar to Iva soils and are adjacent to Miami, Russell, and Xenia soils on the landscape. Iva soils have less sand in the lower part of the solum. Miami soils have more sand and have a brown subsoil. Russell soils have a browner subsoil. Xenia soils do not have mottles in the upper part of the subsoil.

Typical pedon of Fincastle silt loam, 0 to 3 percent slopes, in a pasture, 1,120 feet east and 1,585 feet south of the northwest corner of sec. 25, T. 12 N., R. 2 E.

Ap—0 to 7 inches; grayish brown (10YR 5/2) silt loam, very pale brown (10YR 7/3) dry; common medium faint light gray (10YR 7/2) mottles; moderate medium granular structure; friable; common fine roots; few fine very dark brown (10YR 2/2) iron and manganese oxide accumulations; medium acid; abrupt smooth boundary.

A2—7 to 10 inches; grayish brown (10YR 5/2) silt loam; common medium distinct yellowish brown (10YR 5/6) and few fine distinct light gray (10YR 7/2) mottles; weak medium platy structure parting to moderate fine granular; friable; common fine roots; few fine very dark brown (10YR 2/2) iron and manganese oxide accumulations; medium acid; clear wavy boundary.

B1t—10 to 15 inches; yellowish brown (10YR 5/4) silt loam; common medium distinct light brownish gray (10YR 6/2) mottles; weak medium subangular blocky structure; firm; common fine roots; thin patchy grayish brown (10YR 5/2) silt and clay films on faces of peds; light gray (10YR 7/2) clean silt grains on faces of peds; strongly acid; clear wavy boundary.

B21t—15 to 27 inches; brown (7.5YR 5/4) silty clay loam; common medium distinct light brownish gray (10YR 6/2) mottles; moderate medium and coarse subangular blocky structure; firm; few fine roots; thin patchy dark brown (7.5YR 6/6) clay films on faces of peds; thick continuous grayish brown (10YR 5/2) silt and clay films on faces of peds; light gray (10YR 7/1) clean silt grains on faces of peds; strongly acid; clear wavy boundary.

B22t—27 to 35 inches; light brownish gray (10YR 6/2) silty clay loam; common medium distinct brown (7.5YR 5/6) mottles; moderate coarse subangular blocky structure; firm; few fine roots; thick continuous gray (10YR 5/1) silt and clay films on faces of peds; strongly acid; clear wavy boundary.

IIB23t—35 to 41 inches; yellowish brown (10YR 5/4) clay loam; many medium distinct grayish brown (10YR 5/2) mottles; moderate coarse subangular blocky structure; firm; few fine roots; thick continuous gray (10YR 5/1) silt and clay films on faces of peds; many medium very dark brown (10YR 2/2) iron and manganese oxide accumulations; medium acid; clear wavy boundary.

IIB3t—41 to 52 inches; yellowish brown (10YR 5/4) clay loam; many medium distinct grayish brown (10YR 5/2) mottles; weak coarse subangular blocky structure; firm; thin patchy gray (10YR 5/1) silt and clay films on faces of peds; 3 percent gravel; neutral; clear wavy boundary.

IIC1—52 to 60 inches; yellowish brown (10YR 5/4) loam; common medium distinct grayish brown (10YR 5/2) mottles; massive; friable; slight effervescence; moderately alkaline.

The solum typically is 40 to 55 inches thick. The depth to effervescent material is also typically 40 to 55 inches.

The Ap horizon has hue of 10YR, value of 4 to 6, and chroma of 2 or 3. The B2t horizon has hue of 10YR or 7.5YR, value of 4 to 6, and chroma of 2 to 4. The C horizon has hue of 10YR, value of 5, and chroma of 3 or 4. It is mildly alkaline or moderately alkaline.

Fox series

The Fox series consists of well drained soils on terraces and outwash plains that are moderately deep to sand and gravelly sand. These soils are moderately permeable in the subsoil and rapidly permeable in the substratum. They formed in loamy outwash overlying sand and gravelly sand. Slopes range from 0 to 15 percent.

Fox soils are similar to Martinsville, Miami, and Ockley soils and are adjacent to Ockley soils on the landscape. Martinsville soils have a thicker solum and less gravel. Miami soils do not have a stratified solum and are in higher positions. Ockley soils have a thicker solum.

Typical pedon of Fox loam, 0 to 2 percent slopes, in a cultivated field, 1,320 feet east and 1,720 feet north of the southwest corner of sec. 13, T. 13 N., R. 2 E.

Ap—0 to 7 inches; brown (10YR 4/3) loam, pale brown (10YR 6/3) dry; moderate fine and medium granular structure; friable; common fine roots; slightly acid; abrupt smooth boundary.

A2—7 to 11 inches; brown (10YR 5/3) loam, pale brown (10YR 6/3) dry; moderate medium granular structure; friable; few fine roots; few strong brown (7.5YR 5/6) blotches; medium acid; clear wavy boundary.

B1t—11 to 16 inches; brown (7.5YR 4/4) loam; weak medium subangular blocky structure; friable; few fine roots; thin patchy reddish brown (5YR 4/3) clay films on faces of peds; strongly acid; clear wavy boundary.

B21t—16 to 23 inches; brown (7.5YR 4/4) clay loam; moderate medium subangular blocky structure; firm; few fine roots; thin discontinuous dark brown (7.5 YR 4/4) clay films on faces of peds; 15 percent gravel; medium acid; clear smooth boundary.

B22t—23 to 27 inches; brown (7.5YR 4/4) loam; moderate fine subangular blocky structure; firm, sticky when wet; few fine roots; thin patchy reddish brown (5YR 4/4) clay films on faces of peds; 3 to 5 percent gravel; medium acid; clear smooth boundary.

B23t—27 to 31 inches; reddish brown (5YR 4/4) loam; weak fine subangular blocky structure; friable, slightly sticky when wet; few fine roots; thin patchy reddish brown (5YR 4/3) clay films on faces of peds; 15 percent gravel; medium acid; clear smooth boundary.

B3t—31 to 35 inches; dark brown (7.5YR 3/2) gravelly loam; moderate fine subangular blocky structure; friable, sticky when wet; slightly acid; abrupt irregular boundary.

IIC—35 to 60 inches; very pale brown (10YR 7/3) stratified gravelly sand and sand; loose; strong effervescence; moderately alkaline.

The solum typically is 30 to 40 inches thick, although it ranges from 24 to 40 inches in thickness.

The Ap horizon has hue of 10YR, value of 3 to 6, and chroma of 2 or 3. It commonly is loam but ranges to fine sandy loam or silt loam. In undisturbed areas the A1 horizon is very dark grayish brown (10YR 3/2). The B2t horizon has hue of 10YR, 7.5YR, or 5YR, value of 3 or 4, and chroma of 3 or 4. It is clay loam, loam, sandy clay loam, silty clay loam. The IIC horizon has hue of 10YR, value of 5 to 7, and chroma of 2 to 4.

Genesee series

The Genesee series consists of deep, well drained, moderately permeable soils on flood plains. These soils formed in loamy and silty alluvium. Slopes range from 0 to 2 percent.

Genesee soils are similar to Armiesburg and Haymond soils and are adjacent to Armiesburg and Shoals soils on the landscape. Armiesburg soils have a mollic epipedon. Haymond soils do not have free carbonates within a depth of 40 inches. Shoals soils are grayer and have mottles closer to the surface. They are in slightly lower positions.

Typical pedon of Genesee silt loam, in a cultivated field, 265 feet north and 50 feet east of the southwest corner of sec. 14, T. 11 N., R. 1 W.

Ap—0 to 8 inches; brown (10YR 4/3) silt loam, yellowish brown (10YR 5/4) dry; weak medium granular structure; friable; few fine roots; neutral; abrupt smooth boundary.

C1—8 to 26 inches; dark yellowish brown (10YR 4/4) silt loam; weak medium subangular blocky structure parting to weak medium granular; friable; few fine roots; thin patchy dark brown (10YR 3/3) films on faces of peds; neutral; clear smooth boundary.

C2—26 to 41 inches; yellowish brown (10YR 5/4) silt loam; weak medium subangular blocky structure parting to weak medium granular; friable; thin patchy dark yellowish brown (10YR 4/4) coatings on faces of peds; slight effervescence; mildly alkaline; clear smooth boundary.

C3—41 to 60 inches; yellowish brown (10YR 5/4) loam that has thin strata of sandy loam and sand; weak fine and medium subangular blocky structure; friable; thin patchy dark yellowish brown (10YR 4/4) coatings in old root channels; strong effervescence; moderately alkaline.

The control section ranges from slightly acid to moderately alkaline. Free carbonates are typically within a depth of 20 to 40 inches.

The Ap horizon has hue of 10YR, value of 3 to 5, and chroma of 2 to 4. It commonly is silt loam but ranges to loam, silty clay loam, and sandy loam. The C horizon has hue of 10YR, value of 4 or 5, and chroma of 3 or 4. It is silt loam, loam, or sandy loam. Thin lenses of sand or silty clay loam are in some pedons.

Gilpin series

The Gilpin series consists of moderately deep, well drained, moderately permeable soils on highly dissected uplands. These soils formed in residuum of acid, fine-grained sandstone bedrock. Slopes range from 6 to 25 percent.

Gilpin soils are similar to Berks and Wellston soils and are commonly adjacent to Berks, Wellston, and Zanesville soils on the landscape. Berks soils do not have an argillic horizon, are downslope from Gilpin soils, and are more steeply sloping. Wellston soils have a thicker argillic horizon and are on ridgetops or shoulder slopes. Zanesville soils have a fragipan and are on ridgetops.

Typical pedon of Gilpin silt loam, 18 to 25 percent slopes, in woodland, 2,180 feet west and 2,310 feet south of the northeast corner of sec. 21, T. 11 N., R. 1 E.

A1—0 to 2 inches; very dark brown (10YR 3/1) silt loam, very dark grayish brown (10YR 3/2) crushed, light brownish gray (10YR 6/2) dry; moderate fine and medium granular structure; friable; many fine and medium roots; medium acid; clear wavy boundary.

A2—2 to 4 inches; yellowish brown (10YR 5/4) silt loam; weak medium platy structure parting to weak fine granular; friable; many fine and medium roots; medium acid; clear wavy boundary.

B21t—4 to 10 inches; yellowish brown (10YR 5/4) silt loam; moderate medium subangular blocky structure; firm; common fine roots; thin patchy dark brown (7.5YR 4/4) clay films on faces of peds; strongly acid; clear wavy boundary.

B22t—10 to 24 inches; strong brown (7.5YR 5/6) silt loam; moderate medium subangular blocky structure; firm; common fine roots; thin

discontinuous dark brown (7.5YR 4/4) silt films on faces of peds; moderate amount of very fine sand; 15 percent coarse fragments; very strongly acid; clear wavy boundary.
C—24 to 30 inches; yellowish brown (10YR 5/6) very channery loam; weak fine subangular blocky structure; friable; few fine roots; thin patchy dark brown (7.5YR 4/4) clay films on faces of peds and coarse fragments; 60 percent coarse fragments; very strongly acid; clear irregular boundary.
Cr—30 to 36 inches; rippable sandstone bedrock; 5 percent soil material; very strongly acid.
R—36 inches; hard sandstone bedrock.

The solum typically is 28 to 36 inches thick. Depth to bedrock ranges from 20 to 40 inches.

The A1 horizon has hue of 10YR, value of 3 to 5, and chroma of 1 to 4. It is silt loam or channery silt loam. The B2t horizon has hue of 10YR or 7.5YR, value of 5, and chroma of 4 to 8. It is silt loam, silty clay loam, channery silty clay loam, or channery silt loam. The C horizon has hue of 10YR or 7.5YR, value of 3 to 5, and chroma of 3 to 6.

Grayford series

The Grayford series consists of deep, well drained, moderately permeable soils on uplands. These soils formed in loess, glacial till, and the underlying residuum of limestone bedrock. Slopes range from 6 to 18 percent.

Grayford soils are similar to Alford and Pike soils and are adjacent to Alford and Hickory soils on the landscape. Alford soils have less clay and more silt in the lower part of the solum. Pike soils have a thicker solum. Hickory soils have more sand in the solum and are steeper.

Typical profile of Grayford silt loam, 6 to 12 percent slopes, in a cultivated field, 2,310 feet north and 860 feet east of the southwest corner of sec. 34, T. 12 N., R. 2 W.

Ap—0 to 9 inches; dark yellowish brown (10YR 4/4) silt loam, light yellowish brown (10YR 6/3) dry; moderate medium granular structure; friable; many fine roots; neutral; abrupt smooth boundary.
B21t—9 to 19 inches; yellowish brown (10YR 5/6) silty clay loam; moderate medium subangular blocky structure; friable; common fine roots; thin patchy faint brown (7.5YR 5/4) clay films on faces of peds; medium acid; clear wavy boundary.
B22t—19 to 28 inches; yellowish brown (10YR 5/6) silty clay loam; moderate medium subangular blocky structure; firm; few fine roots; few fine pores; thin discontinuous brown (7.5YR 5/4) clay films on faces of peds; few fine very dark brown (10YR 2/2) iron and manganese oxide accumulations; medium acid; clear wavy boundary.
IIB23t—28 to 40 inches; yellowish brown (10YR 5/6) silt loam; moderate medium subangular blocky structure; firm; common fine pores; thin discontinuous brown (7.5YR 5/4) clay and thin patchy pale brown (10YR 6/3) silt films on faces of peds; medium acid; clear wavy boundary.
IIIB24t—40 to 49 inches; reddish brown (5YR 5/4) silty clay loam; moderate medium subangular blocky structure; firm; common fine pores; thin discontinuous reddish brown (5YR 4/4) clay and thin patchy pale brown (10YR 6/3) silt films on faces of peds; medium acid; clear wavy boundary.
IVB25t—49 to 57 inches; red (2.5YR 5/6) clay; moderate coarse subangular blocky structure; firm; thin discontinuous reddish brown (2.5YR 4/4) clay and thin discontinuous light brownish gray (10YR 6/2) silt films on faces of peds; few pebbles; slightly acid; clear smooth boundary.
IVB26t—57 to 67 inches; red (2.5YR 4/6) clay; moderate coarse angular blocky structure; firm; thin patchy dark red (2.5YR 3/6) clay films on faces of peds; few chert fragments; neutral; abrupt wavy boundary.
R—67 inches; limestone bedrock.

The solum typically is 50 to 80 inches thick. Depth to limestone bedrock is also typically 50 to 80 inches.

The Ap horizon has hue of 10YR, value of 4 or 5, and chroma of 2 to 4. The B2t horizon has hue of 10YR to 2.5YR, value of 4 or 5, and chroma of 3 to 6. The IIB2t horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 3 to 6. It is silty clay loam or silt loam. The IIIB2t horizon has hue of 7.5YR or 5YR, value of 3 to 6, and chroma of 4 to 6. It is silty clay loam, clay loam, or loam. The IVB2t horizon has hue of 5YR or 2.5YR, value of 3 to 5, and chroma of 3 to 8. It is clay or silty clay.

Haymond series

The Haymond series consists of deep, well drained, moderately permeable soils on flood plains. These soils formed in silty alluvium. Slopes range from 0 to 2 percent.

Haymond soils are similar to Genesee soils and are adjacent to Wakeland and Wilbur soils on the landscape. Genesee soils have more sand and more clay in the control section. Wakeland and Wilbur soils have mottles higher in the control section and are in lower positions.

Typical profile of Haymond silt loam, in a cultivated field, 50 feet north and 2,500 feet west of the southeast corner of sec. 32, T. 12 N., R. 1 W.

Ap—0 to 7 inches; brown (10YR 4/3) silt loam, yellowish brown (10YR 5/4) dry; weak medium granular structure; friable; common fine roots; neutral; abrupt smooth boundary.
A12—7 to 11 inches; brown (10YR 4/3) silt loam; weak fine granular structure; friable; common fine roots; few dark brown (10YR 3/3) organic streaks; neutral; gradual smooth boundary.

C1—11 to 15 inches; dark yellowish brown (10YR 4/4) silt loam; weak thin platy structure parting to weak fine granular; friable; few fine roots; neutral; abrupt smooth boundary.
C2—15 to 33 inches; dark yellowish brown (10YR 4/4) silt loam; weak fine granular structure; friable; neutral; abrupt smooth boundary.
C3—33 to 42 inches; dark yellowish brown (10YR 4/4) silt loam; few fine distinct grayish brown (10YR 5/2) mottles; massive; friable; slightly acid; abrupt wavy boundary.
C4—42 to 60 inches; brown (10YR 4/3) and light brownish gray (10YR 5/3) stratified fine sandy loam and loamy sand; friable; slightly acid.

The control section ranges from medium acid to neutral.

The Ap and A1 horizons have hue of 10YR, value of 4 or 5, and chroma of 3 or 4. The C horizon to a depth of about 40 inches has hue of 10YR, value of 4 or 5, and chroma of 3 or 4. Below a depth of 40 inches, the C horizon is stratified loamy sand, fine sandy loam, and silt loam.

Hickory series

The Hickory series consists of deep, well drained, moderately permeable soils on uplands. These soils formed in glacial till. Slopes range from 18 to 50 percent.

Hickory soils are similar to Miami soils and are adjacent to Ava and Cincinnati soils on the landscape. Miami soils have a thinner solum. Ava and Cincinnati soils have a fragipan and are in higher positions.

Typical pedon of Hickory loam, 18 to 50 percent slopes, in a woods, 2,500 feet south and 2,310 feet east of the northwest corner of sec. 34, T. 11 N., R. 2 E.

A1—0 to 4 inches; very dark grayish brown (10YR 3/2) loam, light brownish gray (10YR 6/2) dry; weak fine and medium granular structure; friable; many fine and medium roots; few pebbles; medium acid; clear smooth boundary.
A2—4 to 10 inches; pale brown (10YR 6/3) loam; weak medium subangular blocky structure; friable; many fine and coarse roots; medium acid; clear smooth boundary.
B21t—10 to 15 inches; strong brown (7.5YR 5/6) clay loam; moderate medium subangular blocky structure; firm; common fine and medium roots; thin discontinuous brown (7.5YR 5/4) clay films on faces of peds; thin light brown (7.5YR 6/4) silt flows along old root channels; strongly acid; clear wavy boundary.
B22t—15 to 19 inches; strong brown (7.5YR 5/6) clay loam; moderate fine and medium angular and subangular blocky structure; firm; common fine and medium roots; thin continuous brown (7.5YR 5/4) clay films and thin patchy reddish brown (7.5YR 6/6) silt coatings on faces of peds; 2 percent fine and coarse gravel; strongly acid; clear wavy boundary.
B23t—19 to 25 inches; strong brown (7.5YR 5/6) clay loam; weak coarse prismatic structure parting to moderate medium subangular blocky; firm; few fine roots; thin discontinuous brown (7.5YR 5/4) clay films on faces of peds; 1 percent fine and coarse gravel; strongly acid; clear wavy boundary.
B24t—25 to 32 inches; strong brown (7.5YR 5/6) clay loam; few fine faint light brownish gray (10YR 6/2) and light yellowish brown (10YR 6/4) mottles; moderate medium subangular blocky structure; firm; few fine roots; thin patchy brown (7.5YR 5/4) clay films on faces of peds; 2 percent fine and coarse gravel; strongly acid; clear wavy boundary.
B31t—32 to 44 inches; yellowish brown (10YR 5/6) clay loam; weak coarse subangular blocky structure; firm; 3 percent yellowish red (5YR 4/6) weathered stone fragments; few very dark brown (10YR 2/2) iron and manganese oxide accumulations; 1 percent fine and coarse gravel; slightly acid; clear wavy boundary.
B32—44 to 70 inches; yellowish brown (10YR 5/6) loam; weak coarse subangular blocky structure; very firm; few very dark brown (10YR 2/2) iron and manganese oxide accumulations; 1 percent coarse gravel; neutral; diffuse wavy boundary.
C—70 to 75 inches; yellowish brown (10YR 5/4) loam; massive; very firm; 1 percent coarse gravel; strong effervescence; moderately alkaline.

The solum is 50 to 70 inches thick.

The A1 horizon has hue of 10YR, value of 2 to 4, and chroma of 2. It commonly is loam but ranges to silt loam. The B2t horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 4 to 6. In some pedons the upper part of the B horizon is silty clay loam. The C horizon has hue of 10YR, value of 4 to 6, and chroma of 3 or 4. It is loam or clay loam. It is 1 to 10 percent gravel and ranges from neutral to moderately alkaline.

Iva series

The Iva series consists of deep, somewhat poorly drained, slowly permeable soils on uplands. These soils formed in thick loess. Slopes range from 0 to 3 percent.

Iva soils are similar to Fincastle, Reesville, and Taggart soils and are adjacent to Cincinnati and Vigo soils on the landscape. Fincastle and Taggart soils have more sand in the lower part of the solum and Reesville soils have carbonates within a depth of 60 inches. Cincinnati soils have a browner subsoil, do not have mottles, have a fragipan, and are steeper. Vigo soils have a thicker solum, are grayer, have more sand in the lower part of the solum, and are in slightly lower positions.

Typical pedon of Iva silt loam, 0 to 3 percent slopes, in a cultivated field, 2,440 feet west and 590 feet north of the southeast corner of sec. 2, T. 12 N., R. 2 W.

Ap—0 to 7 inches; grayish brown (10YR 5/2) silt loam, pale brown (10YR 6/3) dry; common fine distinct light brownish gray (10YR 6/2) and few fine distinct light gray (10YR 7/2) mottles; moderate fine and medium granular structure; friable; common fine roots; common fine very dark brown (10YR 2/2) iron and manganese oxide accumulations; neutral; abrupt smooth boundary.

A2—7 to 11 inches; light brownish gray (10YR 6/2) silt loam; few fine faint light gray (10YR 7/2) and common medium distinct yellowish brown (10YR 5/6) mottles; weak medium platy structure parting to moderate fine granular; friable; common fine roots; few fine very dark brown (10YR 2/2) iron and manganese oxide accumulations; slightly acid; clear wavy boundary.

B1t—11 to 19 inches; yellowish brown (10YR 5/6) silt loam; common medium distinct light brownish gray (10YR 6/2) mottles; moderate medium subangular blocky structure; firm; common fine roots; thick continuous grayish brown (10YR 5/2) silt and clay coatings on faces of peds; thin patchy light gray (10YR 7/2) bleached silt grain flows on faces of peds; common fine very dark brown (10YR 2/2) iron and manganese oxide accumulations; strongly acid; clear wavy boundary.

B21t—19 to 28 inches; yellowish brown (10YR 5/6) silty clay loam; common medium distinct light brownish gray (10YR 6/2) mottles; weak medium prismatic structure parting to moderate medium subangular blocky; firm; few fine roots; thick continuous gray (10YR 5/1) silt and clay coatings on faces of peds; thin patchy light gray (10YR 7/2) bleached silt grain flows on faces of peds; common medium very dark brown (10YR 2/2) iron and manganese oxide accumulations; strongly acid; clear wavy boundary.

B22t—28 to 40 inches; yellowish brown (10YR 5/6) silty clay loam; common medium distinct light brownish gray (10YR 6/2) mottles; moderate medium subangular blocky structure; firm; few fine roots; thick continuous grayish brown (10YR 5/2) silt and clay coatings on faces of peds; few fine very dark brown (10YR 2/2) iron and manganese oxide accumulations; strongly acid; clear wavy boundary.

B3t—40 to 53 inches; yellowish brown (10YR 5/4) silt loam; common medium distinct light brownish gray (10YR 6/2) mottles; weak medium subangular blocky structure; firm; few fine roots; thin patchy grayish brown (10YR 5/2) silt and clay coatings on faces of peds; few fine very dark brown (10YR 2/2) iron and manganese oxide accumulations; medium acid; clear wavy boundary.

C—53 to 60 inches; mottled yellowish brown (10YR 5/4, 5/6) and light brownish gray (10YR 6/2) silt loam; massive; friable; few fine roots; slightly acid.

The solum typically is 40 to 60 inches thick.

The Ap horizon has hue of 10YR, value of 4 or 5, and chroma of 2. The B2t horizon has hue of 10YR or 2.5Y, value of 5 or 6, and chroma of 2 to 6. It commonly is silty clay loam but ranges to silt loam. The C horizon has hue of 10YR or 2.5Y, value of 5 or 6, and chroma of 2 to 6. It is silt loam or silt.

Markland series

The Markland series consists of deep, well drained, slowly permeable soils on old dissected lake plains and slack water terraces. These soils formed in calcareous, stratified silty and clayey sediment. Slopes range from 12 to 25 percent.

Markland soils are similar to Alford soils and are adjacent to Bartle, Chetwynd, and Hickory soils on the landscape. Alford soils have a thicker solum and less clay. Bartle soils have mottles closer to the surface, have a fragipan, and are in lower positions. Chetwynd soils have a lower base status. Hickory soils have a thicker solum and less clay. They are in higher positions.

Typical pedon of Markland silt loam, 12 to 18 percent slopes, eroded, in a pasture, 1,850 feet east and 100 feet north of the southwest corner of sec. 19, T. 11 N., R. 3 E.

Ap—0 to 6 inches; dark yellowish brown (10YR 4/4) silt loam, light yellowish brown (10YR 6/4) dry; moderate fine and medium granular structure; friable; many fine roots; neutral; abrupt smooth boundary.

B21t—6 to 14 inches; yellowish brown (10YR 5/4) silty clay loam; strong medium subangular blocky structure; very firm; common fine roots; thin discontinuous dark yellowish brown (10YR 4/4) clay films on faces of peds; slightly acid; clear smooth boundary.

B22t—14 to 22 inches; yellowish brown (10YR 5/4) silty clay; strong medium angular blocky structure; very firm; thin continuous dark yellowish brown (10YR 4/4) clay films on faces of peds; slightly acid; clear smooth boundary.

B3t—22 to 29 inches; yellowish brown (10YR 5/4) silty clay; strong medium subangular blocky structure; very firm; thin patchy dark yellowish brown (10YR 4/4) clay films on faces of peds; neutral; clear smooth boundary.

C—29 to 60 inches; yellowish brown (10YR 5/4) stratified silty clay loam and silty clay; few fine faint yellowish brown (10YR 5/8) mottles; massive; firm; small carbonate accumulations in root channels; strong effervescence; moderately alkaline.

The solum typically is 25 to 40 inches thick, although it ranges from 20 to 45 inches in thickness.

The Ap horizon has hue of 10YR, value of 4 or 5, and chroma of 2 to 4. It commonly is silt loam but ranges to silty clay loam. The B2t horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 3 or 4. The C horizon has hue of 10YR or 2.5Y, value of 3 to 5, and

chroma of 2 to 6. Thin strata of fine sand or silt are in some pedons.

Martinsville series

The Martinsville series consists of deep, well drained, moderately permeable soils on terraces and outwash plains. These soils formed in stratified silty and loamy sediment. Slopes range from 0 to 6 percent.

Martinsville soils are similar to Ockley and Princeton soils and are adjacent to Rensselaer and Whitaker soils on the landscape. Ockley soils have more gravel in the lower part of the solum. Princeton soils are not stratified in the lower part of the solum. Rensselaer soils have a mollic epipedon, are grayer, and have mottles near the surface. They are in lower positions on the landscape. Whitaker soils are grayer and have mottles near the surface. They are on lower rises.

Typical pedon of Martinsville loam, 0 to 2 percent slopes, in a cultivated field, 50 feet west and 2,400 feet south of the northeast corner of sec. 9, T. 11 N., R. 1 E.

Ap—0 to 9 inches; brown (10YR 4/3) loam, pale brown (10YR 6/3) dry; moderate medium granular structure; friable; common fine roots; slightly acid; abrupt smooth boundary.

B1t—9 to 16 inches; yellowish brown (10YR 5/4) loam; moderate medium subangular blocky structure; firm; few fine roots; thin patchy dark yellowish brown (10YR 4/4) clay films on faces of peds; medium acid; clear smooth boundary.

B21t—16 to 36 inches; yellowish brown (10YR 5/4) loam; moderate medium subangular blocky structure; firm; few fine roots; thin discontinuous dark yellowish brown (10YR 4/4) clay films on faces of peds; medium acid; clear smooth boundary.

B22t—36 to 46 inches; yellowish brown (10YR 5/6) clay loam; moderate medium subangular blocky structure; firm; thin discontinuous dark yellowish brown (10YR 4/4) clay films on faces of peds; few very dark brown (10YR 2/2) iron and manganese oxide accumulations; medium acid; clear smooth boundary.

B3—46 to 50 inches; yellowish brown (10YR 5/4) sandy loam; few coarse distinct grayish brown (10YR 5/2) mottles; weak medium subangular blocky structure; friable; medium acid; abrupt smooth boundary.

C—50 to 60 inches; yellowish brown (10YR 5/4) stratified silty clay loam, sand, silt loam, and sandy loam; common medium distinct light brownish gray (10YR 6/2) mottles; massive; firm; mildly alkaline.

The solum typically is 40 to 55 inches thick.

The A horizon has hue of 10YR, value of 4 or 5, and chroma of 2 to 4. It commonly is loam but ranges to sandy loam or silt loam. The B2t horizon has hue of 10YR or 7.5YR, value of 4 to 6, and chroma of 3 to 6. It is loam or clay loam. In many pedons lenses of sandy clay loam, sandy loam, and silt loam are in the lower part of the profile. The C horizon has hue of 10YR, value of 4 or 5, and chroma of 3 or 4. It is stratified silty clay loam, silt loam, sand, sandy loam, sandy clay loam, or loam. It is neutral to moderately alkaline.

Miami series

The Miami series consists of deep, well drained soils on uplands. These soils are moderately permeable in the subsoil and moderately slowly permeable in the underlying material. They formed in loess and in the underlying glacial till. Slopes range from 2 to 50 percent.

Miami soils are similar to Ockley and Martinsville soils and commonly are adjacent to Brookston and Crosby soils on the landscape. Ockley and Martinsville soils have a thicker solum and a stratified substratum. Brookston soils have a mollic epipedon and are in depressions and drainageways. Crosby soils have more clay and have a grayer solum. They are on less sloping rises.

Typical pedon of Miami silt loam, 2 to 6 percent slopes, eroded, in a cultivated field, 495 feet north and 80 feet west of the southeast corner of sec. 36, T. 13 N., R. 2 E.

Ap—0 to 7 inches; brown (10YR 4/3) silt loam, light yellowish brown (10YR 6/4) dry; weak medium granular structure; friable; many fine roots; medium acid; abrupt smooth boundary.

B21t—7 to 11 inches; strong brown (7.5YR 5/6) silty clay loam; moderate medium subangular blocky structure; firm; common fine roots; thin discontinuous dark yellowish brown (10YR 4/4) clay films on faces of peds; 1 percent gravel; medium acid; clear wavy boundary.

IIB22t—11 to 16 inches; strong brown (7.5YR 5/6) clay loam; moderate medium subangular blocky structure; firm; common fine roots; thin discontinuous dark yellowish brown (10YR 4/6) clay films on faces of peds; 1 percent fine gravel; medium acid; clear wavy boundary.

IIB23t—16 to 27 inches; yellowish brown (10YR 5/4) clay loam; moderate medium subangular blocky structure; firm; common fine roots; thin discontinuous brown (10YR 4/3) clay films on faces of peds; 1 percent fine gravel; slightly acid; clear wavy boundary.

IIB3—27 to 32 inches; yellowish brown (10YR 5/4) clay loam; weak medium subangular blocky structure; firm; few fine roots; thin patchy dark yellowish brown (10YR 3/4) clay films on faces of peds; thin fine streaks of organic matter; 1 percent fine and coarse gravel; neutral; clear wavy boundary.

IIC—32 to 60 inches; brown (10YR 5/3) and light yellowish brown (10YR 6/4) loam; weak thick platy rock structure; massive; firm; 6 percent gravel; strong effervescence; moderately alkaline.

The solum is 24 to 36 inches thick.

The Ap horizon has hue of 10YR, value of 3 to 6, and chroma of 2 to 4. It commonly is silt loam but ranges to loam. The B2t horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 3 to 6. The IIB2t horizon is 1 to 5 percent gravel.

Milford series

The Milford series consists of deep, very poorly drained, moderately permeable soils on old lake plains. These soils formed in glacial sediment. Slopes range from 0 to 2 percent.

Milford soils are similar to Montgomery soils and are adjacent to Patton, Rensselaer, and Whitaker soils on the landscape. Montgomery soils have more clay in the subsoil. Patton soils have less clay in the subsoil. Rensselaer soils have more sand in the solum. Whitaker soils have a lighter colored surface layer and more sand in the solum.

Typical pedon of Milford silty clay loam, in a cultivated field, 1,120 feet east and 1,250 feet south of the northwest corner of sec. 11, T. 13 N., R. 2 W.

Ap—0 to 6 inches; very dark brown (10YR 2/2) silty clay loam, grayish brown (10YR 5/2) dry, very dark grayish brown (10YR 3/2) crushed; moderate fine and medium granular structure; firm; few fine roots and partially decomposed corn stalks; neutral; abrupt smooth boundary.

A12—6 to 11 inches; very dark grayish brown (10YR 3/2) silty clay loam, grayish brown (10YR 5/2) dry; few fine faint dark gray (10YR 4/1) mottles; moderate medium subangular blocky structure; very firm; neutral; clear smooth boundary.

B21—11 to 18 inches; very dark grayish brown (10YR 3/2) silty clay loam; common medium distinct gray (10YR 5/1) and few fine distinct dark yellowish brown (10YR 4/6) mottles; moderate medium angular and subangular blocky structure; very firm; neutral; clear smooth boundary.

B22g—18 to 23 inches; gray (10YR 5/1) silty clay loam; common medium distinct dark yellowish brown (10YR 4/4) mottles; moderate medium angular blocky structure; very firm; neutral; clear smooth boundary.

B23g—23 to 33 inches; dark gray (10YR 4/1) silty clay; many medium distinct dark yellowish brown (10YR 4/4) and few fine distinct light gray (10YR 7/1) mottles; moderate medium angular and subangular blocky structure; very firm; neutral; clear smooth boundary.

B24g—33 to 48 inches; gray (N 5/0) silty clay loam; many medium prominent dark yellowish brown (10YR 4/6) mottles; moderate medium subangular blocky structure; firm; neutral; clear smooth boundary.

C—48 to 60 inches; gray (10YR 5/1) stratified fine sandy loam and silty clay loam; many medium distinct dark yellowish brown (10YR 4/6) mottles; massive; firm; neutral.

The solum typically is 40 to 50 inches thick, although it ranges from 40 to 60 inches in thickness.

The Ap horizon has hue of 10YR, value of 2 or 3, and chroma of 1 or 2. It commonly is silty clay loam but ranges to silty clay, clay loam, or silt loam. The B2g horizon has hue of 10YR, 2.5Y, or 5Y, value of 4 to 6, and chroma of 1, or it has hue of N and value of 4 to 6. It is silty clay loam, clay loam, or silty clay. Thin subhorizons in the lower part of the solum range to sandy clay loam and fine sand. The C horizon has hue of 10YR, 2.5Y, or 5Y, value of 4 to 6, and chroma of 1 or 2, or it has hue of N and value of 4 to 6. It is stratified fine sandy loam, clay loam, silty clay loam, or silty clay. It ranges from neutral to moderately alkaline.

Montgomery series

The Montgomery series consists of deep, very poorly drained, very slowly permeable soils on lake plains and slack water terraces. These soils formed in calcareous clayey and silty sediment. Slopes range from 0 to 2 percent.

Montgomery soils are similar to Brookston, Patton, and Zipp soils and are adjacent to Markland soils on the landscape. Brookston soils have more sand in the solum. Patton soils have less clay in the solum. Zipp soils do not have a mollic epipedon. Markland soils have a lighter colored surface layer and a browner subsoil. They are on more sloping breaks.

Typical pedon of Montgomery silty clay loam, in a pasture, 2,600 feet south and 920 feet west of the northeast corner of sec. 15, T. 11 N., R. 1 E.

Ap—0 to 5 inches; very dark grayish brown (10YR 3/1) silty clay loam; grayish brown (10YR 5/2) dry; moderate medium granular structure; friable; many fine roots; few medium black (10YR 2/1) blotches; neutral; abrupt smooth boundary.

A12—5 to 12 inches; black (10YR 2/1) silty clay loam, grayish brown (10YR 5/2) dry; few medium distinct brown (10YR 5/3) and yellowish brown (10YR 5/6) mottles; moderate medium blocky structure; firm; common fine roots; neutral; clear wavy boundary.

B21g—12 to 17 inches; dark gray (10YR 4/1) silty clay; few fine distinct yellowish brown (10YR 5/8) mottles; moderate medium subangular blocky structure; firm; common fine roots; neutral; gradual smooth boundary.

B22g—17 to 23 inches; grayish brown (10YR 5/2) silty clay; few fine distinct yellowish brown (10YR 5/8) mottles; weak coarse prismatic structure parting to moderate medium angular blocky; firm; few fine roots; few fine black (10YR 2/1) iron and manganese oxide accumulations; neutral; gradual smooth boundary.

B23g—23 to 31 inches; gray (10YR 5/1) silty clay; few medium distinct yellowish brown (10YR 5/8) mottles; moderate medium and coarse prismatic structure parting to moderate medium angular blocky; firm; few fine roots; few fine very dark brown (10YR 2/2) iron and manganese oxide accumulations; mildly alkaline; gradual smooth boundary.

B24g—31 to 38 inches; gray (10YR 5/1) silty clay loam; many coarse faint grayish brown (10YR 5/2) and many coarse distinct yellowish brown (10YR 5/8) mottles; moderate medium and coarse prismatic structure parting to moderate fine and medium angular blocky; firm; mildly alkaline; gradual wavy boundary.

B3g—38 to 45 inches; gray (10YR 5/1) silty clay loam; common coarse distinct yellowish brown (10YR 5/8) and common coarse faint grayish brown (10YR 5/2) mottles; weak coarse angular and subangular blocky structure; firm; slight effervescence; mildly alkaline; gradual smooth boundary.

C—45 to 60 inches; mottled gray (10YR 5/1) and light gray (10YR 6/1) stratified silty clay loam and silty clay; many coarse distinct yellowish brown (10YR 5/8) mottles; strong effervescence; moderately alkaline.

The solum typically is 40 to 45 inches thick, although it ranges from 30 to 50 inches in thickness. It is neutral to mildly alkaline.

The Ap horizon has hue of 10YR, value of 2 or 3, and chroma of 1 or 2. It commonly is silty clay loam but ranges to silty clay. The B2g horizon has hue of 10YR or 2.5Y, value of 4 to 6, and chroma of 1 or 2. It is silty clay or silty clay loam. The C horizon has hue of 10YR or 2.5Y, value of 4 or 5, and chroma of 1.

Ockley series

The Ockley series consists of deep, well drained, moderately permeable soils on outwash plains and terraces. These soils formed in loamy outwash overlying stratified gravelly sand and sand. Slopes range from 0 to 6 percent.

Ockley soils are similar to Fox and Martinsville soils and are commonly adjacent to Whitaker soils on the landscape. Fox soils have a thinner solum. Martinsville soils have less gravel in the lower part of the solum. Whitaker soils have a grayer solum and are in lower positions on rises.

Typical pedon of Ockley loam, 0 to 2 percent slopes, in a cultivated field, 1,255 feet north and 1,320 feet west of the southeast corner of sec. 11, T. 13 N., R. 2 E.

Ap—0 to 9 inches; dark brown (10YR 4/3) loam, brown (10YR 5/3) dry; weak medium granular structure; friable; many coarse roots; neutral; abrupt smooth boundary.

A12—9 to 13 inches; dark yellowish brown (10YR 4/4) loam; weak medium platy structure; friable; common fine roots; medium acid; clear smooth boundary.

B21t—13 to 21 inches; brown (7.5YR 5/4) clay loam; weak medium subangular blocky structure; firm; common fine roots; thin patchy brown (7.5YR 4/4) clay films on faces of peds; medium acid; clear smooth boundary.

B22t—21 to 33 inches; strong brown (7.5YR 5/6) clay loam; moderate medium subangular blocky structure; firm; common fine roots; thick continuous brown (7.5YR 4/4) clay films on faces of peds; medium acid; clear smooth boundary.

B23t—33 to 49 inches; reddish brown (5YR 4/4) gravelly clay loam; moderate medium subangular blocky structure; firm; thick continuous dark reddish brown (5YR 3/3) clay films on faces of peds; medium acid; clear smooth boundary.

B24t—49 to 54 inches; reddish brown (5YR 4/3) sandy clay loam; weak medium subangular blocky structure; friable; clay bridges between sand grains; medium acid; abrupt irregular boundary.

IIC—54 to 60 inches; yellowish brown (10YR 5/4) stratified gravelly sand and sand; single grain; loose; strong effervescence; moderately alkaline.

The solum typically is 45 to 55 inches thick. Depth to calcareous gravelly sand and sand is also typically 45 to 55 inches. Thickness of the loess ranges from 0 to 18 inches.

The A horizon has hue of 10YR, value of 4 or 5, and chroma of 2 to 4. It is loam or silt loam. The B2t horizon has hue of 10YR, 7.5YR, or 5YR, value of 4 or 5, and chroma of 3 to 6. It is clay loam, gravelly clay loam, sandy clay loam, or silty clay loam. The C horizon has hue of 10YR, value of 5 to 8, and chroma of 3 to 6.

Parke series

The Parke series consists of deep, well drained, moderately permeable soils on moraines and outwash plains. These soils formed in loess and glacial-fluvial or glacial till deposits. Slopes range from 6 to 18 percent.

Parke soils are similar to Pike soils and are adjacent to Chetwynd, Pike, and Taggart soils on the landscape. Pike soils have a thicker silty clay loam subsoil. Chetwynd soils have more sand in the solum and are on steep breaks. Taggart soils are grayer and are on less sloping rises.

Typical pedon of Parke silt loam, 6 to 12 percent slopes, eroded, in a cultivated field, 260 feet east and 350 feet north of the southwest corner of sec. 27, T. 12 N., R. 1 E.

Ap—0 to 7 inches; brown (10YR 4/3) silt loam, light yellowish brown (10YR 6/4) dry; moderate medium granular structure; friable; many fine roots; slightly acid; abrupt smooth boundary.

B21t—7 to 12 inches; yellowish brown (10YR 5/4) silty clay loam; weak fine and medium subangular blocky structure; firm; common fine roots; thin patchy brown (7.5YR 5/4) clay films on faces of peds; few patchy pale brown (10YR 6/3) silt flows; medium acid; clear wavy boundary.

B22t—12 to 30 inches; strong brown (7.5YR 5/6) silty clay loam; moderate medium and coarse subangular and angular blocky structure; firm; few fine roots; thin continuous reddish brown (5YR 4/4) clay films on faces of peds; strongly acid; clear wavy boundary.

IIB23t—30 to 46 inches; strong brown (7.5YR 5/6) clay loam; moderate coarse subangular blocky structure; firm; few fine roots; thin patchy strong brown (7.5YR 5/8) clay films on faces of peds; strongly acid; clear wavy boundary.

IIB24t—46 to 54 inches; strong brown (7.5YR 5/6) clay loam; weak coarse subangular blocky structure; firm; thin patchy yellowish red (5YR 5/6) and strong brown (7.5YR 5/8) clay films on faces of peds; few medium very dark brown (10YR 2/2) iron and manganese oxide accumulations; strongly acid; abrupt wavy boundary.

IIB31t—54 to 58 inches; yellowish red (5YR 5/6) sandy clay loam; weak coarse subangular blocky structure; firm; thin patchy strong brown (7.5YR 5/6) clay films on faces of peds; common medium very dark brown (10YR 2/2) iron and manganese oxide accumulations; 10 percent fine gravel; strongly acid; clear wavy boundary.

IIB32t—58 to 80 inches; red (2.5YR 5/6) sandy clay loam; massive; firm; thin patchy strong brown (7.5YR 5/6) clay flows in old cracks and planes; common medium very dark brown (10YR 2/2) iron and manganese oxide accumulations; 10 percent fine gravel; very strongly acid.

The solum is 4 to 7 feet thick.

The A horizon has hue of 10YR, value of 3 to 5, and chroma of 2 to 5. The B2t horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 4 to 6. The IIBt horizon has hue of 7.5YR, 5YR, or 2.5YR, value of 4 or 5, and chroma of 4 to 6.

Patton series

The Patton series consists of deep, poorly drained, moderately permeable soils on lakebeds. These soils formed in glacial sediment of the Wisconsin age. Slopes range from 0 to 2 percent. The solum of these soils is thicker than the limit described for the series. However, this difference does not affect the use and management of the soils.

Patton soils are similar to Montgomery soils and are adjacent to Milford, Reesville, and Rensselaer soils on the landscape. Montgomery and Milford soils have more clay in the solum. Reesville soils have an ochric epipedon and are in higher positions on rises. Rensselaer soils have more sand in the solum.

Typical pedon of Patton silty clay loam, in a cultivated field, 390 feet east and 150 feet south of the northwest corner of sec. 26, T. 13 N., R. 2 W.

Ap—0 to 8 inches; very dark grayish brown (10YR 3/2) silty clay loam, grayish brown (10YR 5/2) dry; few fine distinct yellowish brown (10YR 5/6) mottles; moderate medium granular structure; friable; common fine roots; slightly acid; abrupt smooth boundary.

A12—8 to 11 inches; dark brown (10YR 3/3) silty clay loam, grayish brown (10YR 5/2) dry; few fine and medium distinct yellowish brown (10YR 5/6) mottles; moderate fine and medium granular structure; firm; common fine and medium roots; thin patchy very dark grayish brown (10YR 3/2) organic coatings on faces of peds; neutral; clear smooth boundary.

B1tg—11 to 15 inches; gray (10YR 5/1) silty clay loam; common medium distinct yellowish brown (10YR 5/6) mottles; moderate medium subangular blocky structure; firm; common fine roots; thin patchy dark gray (10YR 4/1) clay films and organic coatings on faces of peds; neutral; clear smooth boundary.

B21tg—15 to 24 inches; grayish brown (10YR 5/2) silty clay loam; common medium distinct yellowish brown (10YR 5/8) mottles; weak medium prismatic structure parting to moderate medium subangular blocky; firm; common fine roots; thin discontinuous dark grayish brown (10YR 4/2) clay films on faces of peds; black (N 2/0) tubular channel fillings; neutral; clear smooth boundary.

B22tg—24 to 46 inches; grayish brown (10YR 5/2) silty clay loam; common medium distinct yellowish brown (10YR 5/6) mottles; moderate medium prismatic structure parting to moderate medium subangular blocky; firm; few fine roots; thin discontinuous dark gray (10YR 4/1) clay films on faces of peds; neutral; clear smooth boundary.

B3g—46 to 50 inches; grayish brown (10YR 5/2) silty clay loam; common medium distinct yellowish brown (10YR 5/6) mottles; moderate medium subangular blocky structure; firm; few fine roots; dark gray (10YR 4/1) clay flows in root channels; black (N 2/0) tubular channel fillings; neutral; clear smooth boundary.

C—50 to 60 inches; grayish brown (10YR 5/2) stratified silty clay loam and silt loam; many medium distinct yellowish brown (10YR 5/6) mottles; massive; friable; few fine roots; gray (10YR 5/1) clay flows in root channels; neutral.

The solum typically is 40 to 50 inches thick. It ranges from slightly acid to mildly alkaline.

The A horizon has hue of 10YR, value of 2 or 3, and chroma of 1 to 3. It is silty clay loam or silt loam. The B2 horizon has hue of 10YR or 5Y, value of 3 to 6, and

chroma of 1 or 2. It is silty clay loam or silt loam. The C horizon has hue of 10YR, 5Y, or 2.5Y, value of 4 to 6, and chroma of 1 or 2. Thin strata of fine sand and silt are in some pedons. The C horizon ranges from neutral to moderately alkaline.

Pekin series

The Pekin series consists of deep, moderately well drained soils on low terraces. These soils are moderately permeable in the upper part of the subsoil and very slowly permeable in the fragipan. They formed in strongly acid alluvium derived from glacial drift and in residuum of sandstone and shale. Slopes range from 2 to 6 percent.

Pekin soils are similar to Ava soils and are adjacent to Bartle and Elkinsville soils on the landscape. Ava soils have a thicker solum. Elkinsville soils do not have a fragipan and are in slightly higher positions. Bartle soils have mottles closer to the surface and are in slightly lower positions.

Typical pedon of Pekin silt loam, 2 to 6 percent slopes, in a pasture, 595 feet west and 625 feet south of the northeast corner of sec. 36, T. 11 N., R. 1 W.

Ap—0 to 4 inches; brown (10YR 4/3) silt loam, pale brown (10YR 6/3) dry; moderate medium granular structure; friable; many fine roots; neutral; abrupt smooth boundary.

A2—4 to 8 inches; yellowish brown (10YR 5/4) silt loam; moderate medium platy structure; friable; many fine roots; slightly acid; clear smooth boundary.

B1t—8 to 14 inches; yellowish brown (10YR 5/6) silt loam; moderate medium subangular blocky structure; firm; common fine roots; thin patchy dark yellowish brown (10YR 4/4) clay films on faces of peds; strongly acid; clear wavy boundary.

B2t—14 to 21 inches; yellowish brown (10YR 5/6) silty clay loam; few medium distinct light brownish gray (10YR 6/2) mottles in the lower part; moderate medium subangular blocky structure; firm; common fine roots; thin discontinuous dark yellowish brown (10YR 4/4) clay films on faces of peds; few fine very dark brown (10YR 2/2) iron and manganese oxide accumulations; strongly acid; clear wavy boundary.

Bx1—21 to 35 inches; light brownish gray (10YR 6/2) silty clay loam; many coarse distinct strong brown (7.5YR 5/6) mottles; moderate very coarse prismatic structure parting to weak medium subangular blocky; firm and brittle; few fine roots; common fine pores; thin continuous grayish brown (10YR 5/2) silt films and thin continuous white (10YR 8/1) silt grain flows on faces of peds; few fine yellowish red (5YR 5/6) iron oxide accumulations; strongly acid; clear wavy boundary.

Bx2—35 to 45 inches; light brownish gray (10YR 6/2) silty clay loam; many coarse distinct strong brown (7.5YR 5/6) mottles; moderate very coarse prismatic structure parting to weak medium subangular blocky; firm and brittle; thin discontinuous yellowish brown (10YR 5/4) clay films and thin continuous grayish brown (10YR 5/2) silt films on faces of peds; common yellowish red (5YR 5/6) iron oxide accumulations; strongly acid; clear wavy boundary.

Bx3—45 to 56 inches; light brownish gray (10YR 6/2) silty clay loam; many coarse distinct strong brown (7.5YR 5/8) and many medium distinct yellowish brown (10YR 5/6) mottles; weak coarse prismatic structure parting to weak medium subangular blocky; firm and somewhat brittle; thin continuous grayish brown (10YR 5/2) silt films and thin patchy white (10YR 8/1) silt grain flows on faces of peds; strongly acid; clear wavy boundary.

C—56 to 60 inches; light brownish gray (10YR 6/2) stratified silt loam and silty clay loam; many coarse distinct yellowish brown (10YR 5/4) mottles; massive; friable; thin patchy grayish brown (10YR 5/2) silt coatings in cracks; few yellowish red (5YR 5/6) iron oxide accumulations; medium acid.

The solum is 40 to 60 inches thick.

The Ap horizon has hue of 10YR, value of 4 or 5, and chroma of 2 to 4. The B2t horizon has hue of 10YR, value of 5 or 6, and chroma of 3 to 6. It is silty clay loam or silt loam. The Bx horizon has hue of 10YR, value of 5 or 6, and chroma of 2 or 3. It is silt loam or silty clay loam. The C horizon has hue of 10YR, value of 5 or 6, and chroma of 2 or 3. It ranges from medium acid to neutral. Thin strata of loamy sand or sand are in some pedons.

Pike series

The Pike series consists of deep, well drained, moderately permeable soils on outwash plains and moraines. These soils formed in loess and in glacial-fluvial or glacial till deposits. Slopes range from 0 to 6 percent.

Pike soils are similar to Parke soils and are adjacent to Chetwynd, Parke, and Taggart soils on the landscape. Parke soils have a thinner loess cap and more sand in the lower part of the subsoil. Chetwynd soils have more sand in the solum and are on steeper breaks. Taggart soils have a grayer subsoil and are in slightly lower positions.

Typical pedon of Pike silt loam, 0 to 2 percent slopes, in a hayfield, 2,600 feet west and 1,290 feet north of the southeast corner of sec. 12, T. 11 N., R. 1 E.

Ap—0 to 8 inches; brown (10YR 4/3) silt loam, pale brown (10YR 6/3) dry; moderate medium granular structure; friable; common fine and medium roots; neutral; abrupt smooth boundary.

A2—8 to 13 inches; brown (7.5YR 4/4) silt loam; weak medium subangular blocky structure; friable;

common fine roots; slightly acid; abrupt wavy boundary.
B21t—13 to 26 inches; strong brown (7.5YR 5/6) silty clay loam; moderate medium subangular blocky structure; firm; common fine roots; thin discontinuous dark brown (7.5YR 4/4) clay films on faces of peds; strongly acid; clear wavy boundary.
B22t—26 to 41 inches; strong brown (7.5YR 5/6) silty clay loam; moderate medium subangular blocky structure; firm; few fine roots; thin continuous reddish brown (5YR 4/4) clay films on faces of peds; strongly acid; clear wavy boundary.
B23t—41 to 50 inches; brown (7.5YR 5/4) silt loam; moderate medium subangular blocky structure; firm; few fine roots; thin discontinuous reddish brown (5YR 4/4) clay films on faces of peds; strongly acid; clear wavy boundary.
IIB31tb—50 to 56 inches; brown (7.5YR 5/4) loam; weak medium subangular blocky structure; firm; thin patchy dark brown (7.5YR 4/4) clay films on faces of peds; strongly acid; clear smooth boundary.
IIB32tb—56 to 74 inches; reddish brown (5YR 5/4) and brown (7.5YR 5/4) stratified clay loam and sandy clay loam; weak medium subangular blocky structure; firm; few pebbles; strongly acid; gradual wavy boundary.
IIC—74 to 80 inches; red (2.5YR 4/6) stratified clay loam and sandy clay loam; massive; firm; few pebbles; very strongly acid.

The solum typically is 60 to 80 inches thick.

The Ap horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 3 to 6. The B2t horizon has hue of 10YR, 7.5YR, or 5YR, value of 4 or 5, and chroma of 4 to 6. It is silty clay loam or silt loam. The IIB3tb horizon has hue of 7.5YR, 5YR, or 2.5YR, value of 3 to 5, and chroma of 3 to 6. It is loam, silt loam, silty clay loam, or clay loam. The IIC horizon has hue of 7.5YR, 5YR, or 2.5YR, value of 3 to 5, and chroma of 3 to 6.

Princeton series

The Princeton series consists of deep, well drained soils on uplands. These soils are moderately permeable in the solum and moderately rapidly permeable in the substratum. They formed in windblown coarse silt and fine sand. Slopes range from 0 to 25 percent.

Princeton soils are similar to Martinsville and Ockley soils and are adjacent to Alford and Bloomfield soils on the landscape. Martinsville soils have a stratified solum. Ockley soils have more gravel in the lower part of the argillic horizon. Alford soils have a fine-silty control section and are in slightly lower positions. Bloomfield soils have more sand and have a thinner argillic horizon.

Typical pedon of Princeton fine sandy loam, 12 to 18 percent slopes, in a pasture, 990 feet east and 2,380 feet north of the southwest corner of sec. 27, T. 11 N., R. 1 W.

Ap—0 to 6 inches; brown (10YR 4/3) fine sandy loam, pale brown (10YR 6/3) dry; weak medium granular structure; friable; common fine roots; slightly acid; abrupt smooth boundary.
A2—6 to 11 inches; dark yellowish brown (10YR 4/4) fine sandy loam; weak coarse granular structure; friable; common fine roots; neutral; clear wavy boundary.
B21t—11 to 16 inches; yellowish brown (10YR 5/6) sandy clay loam; moderate fine and medium subangular blocky structure; firm; few fine roots; thin discontinuous brown (7.5YR 5/4) clay films on faces of peds; strongly acid; clear wavy boundary.
B22t—16 to 40 inches; yellowish red (5YR 5/6) sandy clay loam; moderate medium and coarse subangular blocky structure; firm; few fine roots; thin continuous reddish brown (5YR 4/4) clay films on faces of peds; strongly acid; clear wavy boundary.
B31—40 to 48 inches; strong brown (7.5YR 5/6) loamy fine sand; weak fine subangular blocky structure; very friable; clay bridges between some sand grains; medium acid; clear wavy boundary.
B32—48 to 53 inches; yellowish brown (10YR 5/6) loamy fine sand; single grain; loose; thin bands of fine sandy loam; slightly acid; abrupt wavy boundary.
C—53 to 60 inches; light yellowish brown (10YR 5/6) fine sand; single grain; loose; thin bands of fine sandy loam; strong effervescence; moderately alkaline.

The solum is 40 to 60 inches thick.

The Ap horizon has hue of 10YR, value of 4 or 5, and chroma of 2 to 4. It commonly is fine sandy loam but ranges to loam or sandy loam. The B2t horizon has hue of 10YR, 7.5YR, or 5YR, value of 4 to 6, and chroma of 4 to 6. It commonly is sandy clay loam but ranges to clay loam or fine sandy loam. The C horizon has hue of 10YR or 7.5YR, value of 5 or 6, and chroma of 4 to 6. It ranges from slightly acid to moderately alkaline. Thin strata of silt are in some pedons.

Reesville series

The Reesville series consists of deep, somewhat poorly drained, moderately slowly permeable soils on outwash plains and lake plains. These soils formed in loess. Slopes range from 0 to 2 percent.

Reesville soils are similar to Fincastle and Iva soils and are adjacent to Patton soils on the landscape. Fincastle soils have more sand in the lower part of the argillic horizon. Iva soils do not have carbonates. Patton soils have a darker surface layer and do not have an argillic horizon. They are in slightly lower positions.

Typical pedon of Reesville silt loam, in a cultivated field, 1,720 feet west and 1,190 feet south of the northeast corner of sec. 23, T. 13 N., R. 2 W.

Ap—0 to 7 inches; dark grayish brown (10YR 4/2) silt loam, very pale brown (10YR 7/3) dry; few fine faint

light brownish gray (10YR 6/2) and few fine distinct yellowish brown (10YR 5/6) mottles; moderate fine and medium granular structure; friable; common fine roots; slightly acid; abrupt smooth boundary.

A2—7 to 11 inches; grayish brown (10YR 5/2) silt loam; common medium distinct yellowish brown (10YR 5/8) and few fine light brownish gray (10YR 6/2) mottles; weak medium platy structure; friable; few fine roots; medium acid; clear wavy boundary.

B21t—11 to 19 inches; yellowish brown (10YR 5/4) silty clay loam; common medium distinct light brownish gray (10YR 6/2) mottles; moderate medium subangular blocky structure; firm; few fine roots; thick continuous gray (10YR 5/1) silt and clay films on faces of peds; few fine very dark brown (10YR 2/2) iron and manganese oxide accumulations; slightly acid; clear wavy boundary.

B22t—19 to 28 inches; light brownish gray (10YR 6/2) silty clay loam; common medium distinct yellowish brown (10YR 5/6) mottles; moderate medium prismatic structure parting to moderate medium subangular blocky; firm; few fine roots; thick continuous gray (10YR 5/1) silt and clay films on faces of peds; few medium very dark brown (10YR 2/2) iron and manganese oxide accumulations; neutral; clear wavy boundary.

B23t—28 to 46 inches; dark grayish brown (10YR 4/2) silty clay loam; common medium distinct yellowish brown (10YR 5/6) mottles; moderate medium subangular blocky structure; firm; few fine roots; thin continuous gray (10YR 5/1) silt and clay films on ped faces; few fine very dark brown (10YR 2/2) iron and manganese oxide accumulations; neutral; clear wavy boundary.

B3t—46 to 56 inches; yellowish brown (10YR 5/4) silt loam; few fine light brownish gray (10YR 6/2) mottles; weak medium subangular blocky structure; firm; thin discontinuous gray (10YR 5/1) silt and clay films on faces of peds; slight effervescence; mildly alkaline; clear wavy boundary.

C—56 to 60 inches; yellowish brown (10YR 5/6) silt loam; many coarse distinct gray (10YR 6/1) mottles; massive; friable; strong effervescence; moderately alkaline.

The solum typically is 40 to 60 inches thick, although it ranges from 30 to 60 inches.

The Ap horizon has hue of 10YR, value of 4 or 5, and chroma of 2. The B2t horizon has hue of 10YR or 2.5Y, value of 4 or 5, and chroma of 2 to 4. It is silty clay loam or silt loam. The C horizon has hue of 10YR or 2.5Y, value of 4 to 6, and chroma of 2 to 6.

Rensselaer series

The Rensselaer series consists of deep, very poorly drained soils on outwash plains and lakebeds. Permeability is slow in the subsoil and moderate in the substratum. These soils formed in loamy sediment. Slopes range from 0 to 2 percent.

Rensselaer soils are similar to Brookston and Milford soils and are adjacent to Martinsville and Whitaker soils on the landscape. Brookston soils do not have a stratified solum. Milford soils have more clay in the solum. Martinsville soils have a brown subsoil that does not have mottles and are in higher positions. Whitaker soils have a lighter colored surface layer.

Typical pedon of Rensselaer clay loam, in a cultivated field, 1,370 feet west and 1,850 feet south of the northeast corner of sec. 10, T. 13 N., R. 1 W.

Ap—0 to 9 inches; very dark gray (10YR 3/1) clay loam, grayish brown (10YR 5/2) dry; moderate medium granular structure; friable; common fine roots; few pebbles; slightly acid; abrupt smooth boundary.

A12—9 to 18 inches; very dark grayish brown (10YR 3/2) clay loam, grayish brown (10YR 5/2) dry; few fine faint yellowish brown (10YR 5/6) and grayish brown (10YR 5/2) mottles; weak fine and medium subangular blocky structure; firm; few fine roots; few thin very dark gray (10YR 3/1) organic streaks; neutral; clear wavy boundary.

B21tg—18 to 26 inches; dark gray (10YR 4/1) clay loam; common medium distinct dark yellowish brown (10YR 4/6) mottles; weak coarse prismatic structure parting to moderate medium subangular blocky; firm; few fine roots; thin discontinuous dark grayish brown (10YR 4/2) clay films on faces of peds; neutral; clear wavy boundary.

B22tg—26 to 32 inches; grayish brown (10YR 5/2) clay loam; many fine distinct yellowish brown (10YR 5/8) and few fine faint gray (10YR 5/1) mottles; weak coarse prismatic structure parting to moderate medium subangular blocky; firm; few fine roots; thin discontinuous dark gray (10YR 4/1) clay films on faces of peds; neutral; clear wavy boundary.

B23tg—32 to 39 inches; grayish brown (10YR 5/2) clay loam; common medium distinct yellowish brown (10YR 5/8) and few medium distinct gray (10YR 6/1) mottles; moderate medium and coarse prismatic structure parting to moderate medium subangular blocky; firm; few fine roots; medium continuous gray (10YR 5/1) clay films on faces of peds; few very dark brown (10YR 2/2) iron and manganese oxide stains; neutral; clear wavy boundary.

B3tg—39 to 47 inches; gray (10YR 5/1) clay loam; many coarse distinct yellowish brown (10YR 5/8) and common medium faint gray (10YR 6/1) mottles; weak medium subangular blocky structure; firm; thin patchy grayish brown (10YR 5/2) clay films on faces of peds; neutral; abrupt wavy boundary.

IIC—47 to 60 inches; gray (10YR 5/1) stratified clay loam and loamy sand; dark gray (10YR 4/1) thin discontinuous sand lens; many coarse distinct yellowish brown (10YR 5/6) mottles; very friable;

few pebbles; strong effervescence; moderately alkaline.

The solum is 30 to 50 inches thick.

The Ap horizon has hue of 10YR, value of 2 or 3, and chroma of 1 or 2. It is commonly clay loam but ranges to loam and silty clay loam. The B2tg horizon has hue of 10YR or 2.5Y, value of 4 to 6, and chroma of 1 or 2. It is commonly clay loam but ranges to silty clay loam, sandy clay loam, loam, or fine sandy loam. The C horizon has hue of 10YR or 2.5Y, value of 4 to 6, and chroma of 1 or 2. It is stratified fine sand, loamy sand, sand, sandy clay loam, or clay loam. It is neutral to moderately alkaline.

Ross series

The Ross series consists of deep, well drained, moderately permeable soils on flood plains and low terraces. These soils formed in loamy alluvium. Slopes range from 0 to 2 percent.

Ross soils are similar to Armiesburg and Genesee soils and are adjacent to Genesee and Shoals soils on the landscape. Armiesburg soils have less sand in the control section and a thinner mollic epipedon. Genesee soils do not have a mollic epipedon. Shoals soils do not have a mollic epipedon and have mottles closer to the surface. They are in slightly lower positions on the landscape.

Typical pedon of Ross loam, in a cultivated field, 2,100 feet north and 50 feet east of the southwest corner of sec. 8, T. 12 N., R. 2 E.

Ap—0 to 9 inches; dark brown (10YR 3/3) loam, brown (10YR 5/3) dry; moderate medium granular structure; friable; common fine roots; slightly acid; abrupt smooth boundary.

A12—9 to 20 inches; dark brown (10YR 3/3) silt loam, brown (10YR 5/3) dry; weak medium subangular blocky structure; friable; common fine roots; slightly acid; clear smooth boundary.

B2—20 to 30 inches; dark brown (10YR 3/3) loam, brown (10YR 5/3) dry; weak medium subangular blocky structure; firm; few fine roots; neutral; clear wavy boundary.

C—30 to 60 inches; dark grayish brown (10YR 4/2) loam; massive; firm; few fine dark brown (7.5YR 4/4) iron and manganese oxide accumulations; neutral.

The solum is 25 to 35 inches thick.

The A and B horizons have hue of 10YR, value of 2 or 3, and chroma of 2 or 3. They commonly are loam or silt loam but range to sandy loam. The C horizon has hue of 10YR or 7.5YR, value of 4, and chroma of 2 to 4. It is loam or silt loam. Thin strata of loamy sand or sand are in some pedons.

Russell series

The Russell series consists of deep, well drained soils on uplands. These soils are moderately permeable in the subsoil and moderately slowly permeable in the substratum. They formed in loess and in the underlying glacial till. Slopes range from 2 to 6 percent.

Russell soils are similar to Alford and Pike soils and are adjacent to Fincastle and Xenia soils on the landscape. Alford and Pike soils have less sand in the lower part of the solum. Fincastle soils have a grayer solum and are on less sloping rises. Xenia soils have a mottled solum and are in positions similar to those of the Russell soils.

Typical pedon of Russell silt loam, 2 to 6 percent slopes, in a hayfield, 1,180 feet east and 2,375 feet south of the northwest corner of sec. 11, T. 13 N., R. 1 E.

Ap—0 to 8 inches; dark grayish brown (10YR 4/2) silt loam, pale brown (10YR 6/3) dry; weak medium granular structure; friable; common fine roots; slightly acid; abrupt smooth boundary.

B1t—8 to 14 inches; yellowish brown (10YR 5/4) silt loam; weak fine and medium subangular blocky structure; firm; common fine roots; thin patchy dark yellowish brown (10YR 4/4) clay films on faces of peds; slightly acid; clear wavy boundary.

B21t—14 to 22 inches; dark yellowish brown (10YR 4/4) silty clay loam; moderate medium subangular blocky structure; firm; common fine roots; thin discontinuous dark yellowish brown (10YR 4/4) clay films on faces of peds; medium acid; clear wavy boundary.

IIB22t—22 to 41 inches; yellowish brown (10YR 5/4) clay loam; strong medium angular and subangular blocky structure; firm; few fine roots; medium continuous dark yellowish brown (10YR 4/4) clay films on faces of peds; few pebbles; medium acid; clear wavy boundary.

IIB23t—41 to 52 inches; yellowish brown (10YR 5/4) clay loam; moderate medium subangular blocky structure; firm; few fine roots; thin discontinuous dark brown (10YR 4/3) clay films on faces of peds; few coarse pebbles; medium acid; clear wavy boundary.

IIB3t—52 to 59 inches; yellowish brown (10YR 5/4) loam; weak medium subangular blocky structure; firm; thin patchy dark yellowish brown (10YR 4/4) clay films on faces of peds; few fine pebbles; slightly acid; clear wavy boundary.

IIC—59 to 65 inches; brown (10YR 5/3) loam; thick platy rock structure; firm; strong effervescence; moderately alkaline.

The solum typically is 45 to 60 inches thick.

The Ap horizon has hue of 10YR, value of 4 or 5, and chroma of 2 or 3. The B2t and IIB2t horizons have hue

of 10YR or 7.5YR, value of 4 or 5, and chroma of 4 to 6. The C horizon has hue of 10YR, value of 5 to 7, and chroma of 3 or 4. Gravel content ranges from 0 to 10 percent.

Shoals series

The Shoals series consists of deep, somewhat poorly drained, moderately permeable soils on flood plains. These soils formed in loamy and silty alluvium. Slopes range from 0 to 2 percent.

Shoals soils are similar to Wakeland soils and are adjacent to Genesee and Sloan soils on the landscape. Wakeland soils have more silt in the control section. Genesee soils have a brown control section that does not have mottles. They are in higher positions on the landscape. Sloan soils have a mollic surface layer and are in depressions and drainageways.

Typical pedon of Shoals silt loam, in a cultivated field, 100 feet north and 75 feet east of the southwest corner of sec. 17, T. 11 N., R. 1 W.

Ap—0 to 8 inches; dark grayish brown (10YR 4/2) silt loam, brown (10YR 5/3) dry; moderate medium granular structure; friable; common fine roots; neutral; abrupt smooth boundary.

C1—8 to 16 inches; dark grayish brown (10YR 4/2) silt loam; common fine distinct brown (10YR 5/3) and light brownish gray (10YR 6/2) mottles; weak medium granular structure; friable; common fine roots; neutral; clear smooth boundary.

C2—16 to 26 inches; brown (10YR 5/3) loam; few fine distinct light brownish gray (10YR 4/2) and yellowish brown (10YR 5/4) mottles; moderate medium granular structure; friable; few fine roots; neutral; gradual smooth boundary.

C3—26 to 40 inches; yellowish brown (10YR 5/4) loam; many fine distinct dark grayish brown (10YR 4/2) mottles; moderate medium granular structure; friable; neutral; gradual smooth boundary.

C4—40 to 60 inches; light brownish gray (10YR 6/2) loam; many medium distinct yellowish brown (10YR 5/4) mottles; weak medium granular structure; friable; neutral.

The control section ranges from slightly acid to mildly alkaline.

The A horizon has hue of 10YR, value of 4 or 5, and chroma of 2. It is silt loam, loam, or silty clay loam. The C horizon has hue of 10YR or 2.5Y, value of 4 to 6, and chroma of 2 to 4. Thin subhorizons of silty clay loam or clay loam are in some pedons. In some pedons the C horizon is stratified below a depth of about 40 inches. The C horizon is loamy sand, sandy loam, loam, silt loam, clay loam, and silty clay loam, and thin lenses of sand.

Sloan series

The Sloan series consists of deep, very poorly drained, moderately slowly permeable soils on flood plains. These soils formed in silty and loamy alluvium. Slopes range from 0 to 2 percent.

Sloan soils are similar to Patton and Rensselaer soils and are adjacent to Shoals soils on the landscape. Patton soils have more silt in the solum. Rensselaer soils have an argillic horizon. Shoals soils do not have a mollic surface layer and are in higher positions on rises.

Typical pedon of Sloan silty clay loam, in a cultivated field, 1,915 feet east and 1,250 feet south of the northwest corner of sec. 5, T. 11 N., R. 1 E.

Ap—0 to 9 inches; very dark grayish brown (10YR 3/2) silty clay loam, grayish brown (10YR 5/2) dry; few fine distinct yellowish brown (10YR 5/8) mottles; moderate medium granular structure; friable; many fine roots; mildly alkaline; abrupt smooth boundary.

A12—9 to 18 inches; very dark grayish brown (10YR 3/2) silty clay loam, grayish brown (10YR 5/2) dry; common fine distinct pale brown (10YR 6/3) and few fine distinct yellowish brown (10YR 5/6) mottles; moderate fine and medium subangular blocky structure; firm; common fine roots; light brownish gray (10YR 6/2) silt flows on faces of peds; many fine red (2.5YR 4/6) iron accumulations and few fine black (10YR 2/1) iron and manganese oxide accumulations; mildly alkaline; clear wavy boundary.

B21g—18 to 25 inches; dark gray (10YR 4/1) silty clay loam; few fine distinct yellowish brown (10YR 5/4) mottles; weak medium prismatic structure parting to weak fine subangular blocky; firm; few fine roots; common fine red (2.5YR 4/6) iron accumulations; few brown (10YR 4/3) organic streaks; few small snail shells; 15 to 20 percent fine and coarse sand; mildly alkaline.

B22g—25 to 42 inches; gray (N 6/0) clay loam; many medium distinct dark yellowish brown (10YR 4/4) mottles; weak coarse prismatic structure parting to weak medium subangular blocky; firm; many small snail and clam shells; strong effervescence; moderately alkaline; clear smooth boundary.

B3g—42 to 55 inches; gray (5Y 5/1) clay loam; fine medium distinct yellowish brown (10YR 5/6) mottles; weak coarse subangular blocky structure; firm; dark yellowish brown (10YR 4/6) coatings in old root channels; common small snail and clam shells; thin strata of sand; strong effervescence; moderately alkaline; abrupt wavy boundary.

IIC—55 to 60 inches; grayish brown (10YR 5/2) and dark grayish brown (10YR 4/2) stratified sand and sandy loam; single grain to massive; loose to friable; strong effervescence; moderately alkaline.

The control section typically is mildly alkaline or moderately alkaline, although it ranges from neutral to moderately alkaline.

The A horizon has hue of 10YR or 2.5Y, value of 2 or 3, and chroma of 1 or 2, or it has hue of N and value of 2 or 3. It is silty clay loam, loam, silt loam, or clay loam. The Bg horizon has hue of 10YR or 2.5Y, value of 4 to 6, and chroma of 1 or 2, or it has hue of N and value of 4 to 6. Thin lenses of loam, sandy loam, or sand are in some pedons. The C horizon is stratified sand, sandy loam, loam, silt loam, or sandy clay loam.

Stonelick series

The Stonelick series consists of deep, well drained, moderately rapidly permeable soils on flood plains. These soils formed in loamy and sandy alluvium. Slopes range from 0 to 2 percent.

Stonelick series are similar to Genesee soils and are adjacent to Genesee and Shoals soils on the landscape. Genesee soils have more silt and clay. Shoals soils have more silt and clay and have a mottled control section. They are in lower positions on rises.

Typical pedon of Stonelick sandy loam, in a cultivated field, 130 feet south and 2,110 feet east of the northwest corner of sec. 5, T. 11 N., R. 1 E.

Ap—0 to 9 inches; dark brown (10YR 3/3) sandy loam; pale brown (10YR 6/3) dry; weak fine and medium granular structure; friable; many fine roots; slight effervescence; mildly alkaline; abrupt smooth boundary.

C1—9 to 26 inches; yellowish brown (10YR 5/4) sandy loam; weak fine and medium granular structure; friable; common roots; slight effervescence; mildly alkaline; clear smooth boundary.

C2—26 to 35 inches; dark yellowish brown (10YR 4/4) sandy loam; weak fine and medium subangular blocky structure; friable; few fine roots; strong effervescence; moderately alkaline; clear smooth boundary.

C3—35 to 45 inches; yellowish brown (10YR 5/4) loamy sand; weak fine granular structure; loose; few roots; strong effervescence; moderately alkaline; clear smooth boundary.

C4—45 to 60 inches; yellowish brown (10YR 5/4) sandy loam; weak fine granular structure; friable; strong effervescence, moderately alkaline.

The Ap horizon has hue of 10YR, value of 3 to 5, and chroma of 2 to 6. It is sandy loam, loamy sand, or loam. The C horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 3 or 4. It is sandy loam, loamy sand, loam, or silt loam. Gravel content ranges from 0 to 20 percent.

Taggart series

The Taggart series consists of deep, somewhat poorly drained, slowly permeable soils on outwash plains and valley trains. These soils formed in loess and in glaciofluvial material. Slopes range from 0 to 2 percent.

Taggart soils are similar to Fincastle and Vigo soils and are adjacent to Parke and Pike soils on the landscape. Fincastle soils do not have a stratified solum. Vigo soils have colors of lower chroma in the upper 50 inches. Parke and Pike soils have a browner solum and do not have mottles in the upper 30 inches. They are in slightly higher positions on the landscape.

Typical pedon of Taggart silt loam, in a hayfield, 1,460 feet east and 1,320 feet north of the southwest corner of sec. 7, T. 11 N., R. 2 E.

Ap—0 to 8 inches; grayish brown (10YR 5/2) silt loam, light brownish gray (10YR 6/2) dry; few fine faint light brownish gray (10YR 6/2) mottles; moderate fine and medium granular structure; friable; many fine roots; common medium very dark brown (10YR 2/2) iron and manganese oxide accumulations; neutral; abrupt smooth boundary.

A12—8 to 12 inches; grayish brown (10YR 5/2) silt loam; common medium faint gray (10YR 5/1) and few fine distinct light gray (10YR 7/1) mottles; weak thin platy structure; friable; common fine roots; common fine and medium very dark brown (10YR 2/2) iron and manganese oxide accumulations; neutral; abrupt wavy boundary.

B21t—12 to 23 inches; yellowish brown (10YR 5/4) silt loam; common medium distinct yellowish brown (10YR 5/8) mottles; weak medium prismatic structure parting to moderate medium subangular blocky; firm; few fine roots; thick continuous grayish brown (10YR 5/2) silt films on faces of peds; few thin light gray (10YR 7/1) silt flows; common fine very dark brown (10YR 2/2) iron and manganese oxide accumulations; medium acid; clear wavy boundary.

B22tg—23 to 31 inches; grayish brown (10YR 5/2) silt loam; many coarse distinct yellowish brown (10YR 5/8) mottles; moderate coarse prismatic structure parting to moderate medium subangular blocky; firm; few fine roots; thick continuous light gray (10YR 6/1) clay and silt films on faces of peds; strongly acid; clear wavy boundary.

B23tg—31 to 40 inches; light gray (10YR 6/1) silty clay loam; many coarse distinct yellowish brown (10YR 5/8) mottles; moderate coarse prismatic structure parting to moderate medium subangular blocky; firm; few fine roots; thick continuous gray (10YR 5/1) silt films on faces of peds; many coarse very dark brown (10YR 2/2) iron and manganese oxide accumulations; very strongly acid; abrupt irregular boundary.

IIB23t—40 to 52 inches; yellowish brown (10YR 5/4) clay loam; moderate medium subangular blocky structure; firm; thick discontinuous light gray (10YR 6/1) silt and clay films on faces of peds; many fine and medium very dark brown (10YR 2/2) iron and manganese oxide accumulations; strongly acid; clear wavy boundary.

IIC—52 to 80 inches; strong brown (7.5YR 5/6) clay loam; massive; firm; strongly acid.

The solum typically is 45 to 72 inches thick. The subsoil ranges from medium acid to very strongly acid.

The Ap horizon has hue of 10YR, value of 4 to 6, and chroma of 1 or 2. The B2tg horizon has hue of 10YR or 2.5Y, value of 4 to 6, and chroma of 1 to 4. The IIB2t is clay loam, sandy clay loam, or loam. The C horizon has hue of 10YR, 7.5YR, or 5YR, value of 3 to 5, and chroma of 1 to 6. It is sandy loam, loam, clay loam, or sandy clay loam.

Vigo series

The Vigo series consists of deep, somewhat poorly drained or poorly drained, very slowly permeable soils on uplands. These soils formed in loess and in the underlying glacial till. Slopes range from 0 to 2 percent.

Vigo soils are similar to Iva and Taggart soils and are adjacent to Ava and Cincinnati soils on the landscape. Iva and Taggart soils have brighter colors in the upper part of the solum. Ava and Cincinnati soils have a fragipan and are gently sloping to strongly sloping.

Typical pedon of Vigo silt loam, 0 to 2 percent slopes, in a cultivated field, 2,500 feet east and 1,325 feet south of the northwest corner of sec. 9, T. 12 N., R. 2 W.

Ap—0 to 10 inches; gray (10YR 5/1) silt loam, light gray (10YR 7/1) dry; few fine distinct brown (10YR 4/3) mottles; weak thin platy structure; friable; common fine roots; medium acid; abrupt smooth boundary.

A&B—10 to 21 inches; A2 part is gray (10YR 6/1) silt loam; few fine distinct brown (10YR 4/3) mottles; weak fine medium subangular blocky structure; friable; B part is many pellets and semi-rounded fragments of yellowish brown (10YR 5/6) silty clay loam; common fine roots; medium acid; clear wavy boundary.

B21tg—21 to 46 inches; light gray (10YR 7/1) silty clay loam; few medium distinct yellowish brown (10YR 5/8) mottles; moderate medium columnar structure parting to weak medium subangular blocky; very firm; thick continuous gray (10YR 6/1) silt and clay films on faces of peds; strongly acid; clear wavy boundary.

IIB22t—46 to 68 inches; yellowish brown (10YR 5/8) clay loam; many medium distinct light gray (10YR 7/2) mottles; moderate coarse prismatic structure parting to weak coarse subangular blocky; firm; thin continuous gray (10YR 6/1) silt and clay films on faces of peds; strongly acid; clear wavy boundary.

IIB3—68 to 80 inches; yellowish brown (10YR 5/8) loam; few medium distinct light gray (10YR 7/2) mottles; weak coarse subangular blocky structure; firm; neutral.

The Ap horizon has hue of 10YR, value of 4 to 7, and chroma of 1 or 2. The B2t horizon has hue of 10YR, value of 4 to 7, and chroma of 1 or 2. The IIB horizon has hue of 10YR, value of 5 or 6, and chroma of 3 to 8.

Wakeland series

The Wakeland series consists of deep, somewhat poorly drained, moderately permeable soils on flood plains. These soils formed in silty alluvium. Slopes range from 0 to 2 percent.

Wakeland soils are similar to Shoals soils and are adjacent to Haymond and Wilbur soils on the landscape. Shoals soils have more sand. Haymond and Wilbur soils have a browner control section and are in higher lying positions on the landscape.

Typical pedon of Wakeland silt loam, in an idle pasture, 1,190 feet east and 200 feet south of the northwest corner of sec. 16, T. 11 N., R. 1 E.

Ap—0 to 6 inches; brown (10YR 4/3) silt loam, pale brown (10YR 6/3) dry; few fine distinct light brownish gray (10YR 6/2) mottles; moderate fine granular structure; friable; many fine roots; slightly acid; abrupt smooth boundary.

C1—6 to 15 inches; brown (10YR 5/3) silt loam; common fine distinct light brownish gray (10YR 6/2) and yellowish brown (10YR 5/6) mottles; weak medium subangular blocky structure; friable; common fine roots; few fine very dark brown (10YR 2/2) iron and manganese oxide accumulations; slightly acid; clear smooth boundary.

C2—15 to 19 inches; light brownish gray (10YR 6/2) silt loam; many medium distinct brown (10YR 5/3) and common fine distinct yellowish brown (10YR 5/6) mottles; weak medium subangular blocky structure; friable; common fine roots; common fine very dark brown (10YR 2/2) iron and manganese oxide accumulations; slightly acid; clear smooth boundary.

C3—19 to 37 inches; grayish brown (10YR 5/2) silt loam; common medium distinct yellowish brown (10YR 5/6) and many medium distinct light gray (10YR 7/2) mottles; weak medium subangular blocky structure; friable; few fine roots; common medium very dark brown (10YR 2/2) iron and manganese oxide accumulations; neutral; abrupt smooth boundary.

C4—37 to 47 inches; grayish brown (10YR 5/2) silt loam; common coarse prominent strong brown (7.5YR 5/6) and few medium distinct light gray (10YR 7/2) mottles; weak medium subangular blocky structure; friable; few fine very dark brown (10YR 2/2) iron and manganese oxide accumulations; neutral; abrupt smooth boundary.

C5—47 to 60 inches; gray (10YR 5/1), strong brown (7.5YR 5/6), and grayish brown (10YR 5/2) silt loam; massive; friable; few fine pores; neutral.

The control section is medium acid to neutral.

The Ap horizon has hue of 10YR, value of 3 to 5, and chroma of 2 or 3. The C horizon has hue of 10YR, value of 5 or 6, and chroma of 1 to 4.

Weikert series

The Weikert series consists of shallow, well drained, moderately rapidly permeable soils on uplands. These soils formed in residuum of sandstone, siltstone, or shale bedrock. Slopes range from 40 to 80 percent.

Weikert soils are similar to Berks soils and are adjacent to Berks, Gilpin, and Hickory soils on the landscape. Berks soils have a thicker solum. Gilpin and Hickory soils have a thicker solum and have an argillic horizon. They are in less sloping positions on the landscape.

Typical pedon of Weikert channery silt loam, 40 to 80 percent slopes, in woods, 1,320 feet north and 1,980 feet west of the southeast corner of sec. 18, T. 11 N., R. 2 E.

A1—0 to 3 inches; dark grayish brown (10YR 4/2) channery silt loam, grayish brown (10YR 5/2) dry; moderate fine granular structure; friable; many fine and medium roots; strongly acid; clear smooth boundary.
B2—3 to 9 inches; light yellowish brown (10YR 6/4) channery silt loam; weak fine subangular blocky structure; friable; common fine and medium roots; strongly acid; clear wavy boundary.
C—9 to 17 inches; light yellowish brown (10YR 6/4) very channery silt loam; massive; friable; common medium roots; strongly acid; clear wavy boundary.
R—17 inches; sandstone bedrock.

The solum is 8 to 20 inches thick.

The A horizon has hue of 10YR, value of 4 or 5, and chroma of 2 to 4. It is channery silt loam, very channery silt loam, shaly silt loam, or very shaly silt loam. The B2 horizon has hue of 10YR or 7.5YR, value of 5 or 6, and chroma of 4 to 6. It is channery silt loam, very channery silt loam, or very shaly silt loam. The C horizon has hue of 2.5Y, 7.5YR, or 10YR, value of 4 to 6, and chroma of 3 to 6. Some pedons do not have a C horizon. The bedrock is dominantly sandstone, but in places it is siltstone or shale.

Wellston series

The Wellston series consists of deep, well drained, moderately permeable soils on ridgetops. These soils formed in loess and residuum of sandstone and shale bedrock. Slopes range from 6 to 12 percent.

Wellston soils are similar to Cincinnati and Zanesville soils and are adjacent to Berks, Gilpin, and Zanesville soils on the landscape. Cincinnati and Zanesville soils have a fragipan. Berks soils do not have an argillic horizon and are steeper. Gilpin soils have a thinner solum and are in higher positions on the landscape. Zanesville soils are on less sloping ridgetops.

Typical pedon of Wellston silt loam, 6 to 12 percent slopes, in woods, 1,585 feet west and 1,150 feet south of the northeast corner of sec. 33, T. 11 N., R. 1 E.

O1—1 inch to 0; decomposed and undecomposed leaf litter.
A1—0 to 3 inches; very dark grayish brown (10YR 3/2) silt loam, pale brown (10YR 6/3) dry; weak fine granular structure; friable; many fine and medium roots; medium acid; abrupt smooth boundary.
A2—3 to 7 inches; yellowish brown (10YR 5/4) silt loam; weak medium platy structure parting to weak medium granular; friable; many medium and coarse roots; strongly acid; clear wavy boundary.
B1t—7 to 12 inches; yellowish brown (10YR 5/4) silt loam; weak medium subangular blocky structure; friable; common fine and medium roots; thin patchy dark yellowish brown (10YR 4/4) clay films on faces of peds; very strongly acid; clear wavy boundary.
B21t—12 to 24 inches; brown (7.5YR 5/4) silty clay loam; moderate medium subangular blocky structure; firm; common fine and medium roots; thin discontinuous dark brown (7.5YR 4/4) clay films on faces of peds; very strongly acid; clear wavy boundary.
B22t—24 to 36 inches; brown (7.5YR 5/4) silty clay loam; moderate medium subangular blocky structure; common fine roots; thin discontinuous dark brown (7.5YR 4/4) clay and thin patchy light brownish gray (10YR 6/2) silt films on faces of peds; very strongly acid; clear wavy boundary.
IIB23t—36 to 46 inches; strong brown (7.5YR 5/6) silt loam; moderate medium subangular blocky structure; firm; common fine roots; thin patchy dark brown (7.5YR 4/4) clay and thick continuous pale brown (10YR 6/3) silt films on faces of peds; few fine quartz pebbles; very strongly acid; clear wavy boundary.
IIB3—46 to 50 inches; strong brown (7.5YR 5/6) loam; weak medium subangular blocky structure; firm; few fine roots; thin continuous pale brown (10YR 6/3) silt films on faces of peds; few fine black (10YR 2/1) iron and manganese oxide accumulations; 5 percent sandstone fragments; very strongly acid; abrupt irregular boundary.
IIR—50 inches; fractured sandstone bedrock.

The solum is 38 to 50 inches thick. Depth to bedrock ranges from 40 to 65 inches.

The A1 horizon has hue of 10YR, value of 3 or 4, and chroma of 2 or 3. The B2t horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 4 to 8. It is silty clay loam or silt loam. It is strongly acid or very strongly acid. The IIB horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 6.

Whitaker series

The Whitaker series consists of deep, somewhat poorly drained, moderately permeable soils on outwash plains and lakebeds. These soils formed in glacial sediment. Slopes range from 0 to 2 percent.

Whitaker soils are similar to Crosby soils and are adjacent to Martinsville and Rensselaer soils on the landscape. Crosby soils have more clay in the solum and are not stratified. Martinsville soils have a browner subsoil and are in higher positions on the landscape. Rensselaer soils have a thick, dark colored surface layer and are in lower positions on the landscape.

Typical pedon of Whitaker loam, in a cultivated field, 1,580 feet west and 130 feet south of the northeast corner of sec. 10, T. 13 N., R. 1 W.

Ap—0 to 9 inches; dark grayish brown (10YR 4/2) loam, light brownish gray (10YR 6/2) dry; moderate fine and medium granular structure; friable; few fine black (10YR 2/1) iron and manganese oxide stains; common fine roots; medium acid; abrupt smooth boundary.

B1—9 to 14 inches; light yellowish brown (10YR 6/4) loam; few fine and medium distinct gray (10YR 6/1) mottles; weak medium subangular blocky structure; friable; common fine roots; few fine black (10YR 2/1) iron and manganese oxide stains; medium acid; clear smooth boundary.

B21t—14 to 24 inches; brown (10YR 5/3) clay loam; few fine light brownish gray (10YR 6/2) and yellowish brown (10YR 5/8) mottles; weak coarse prismatic structure parting to moderate medium subangular blocky; firm; few fine roots; thin continuous grayish brown (10YR 5/2) clay films on faces of peds; few fine black (10YR 2/1) iron and manganese oxide stains; medium acid; clear smooth boundary.

B22t—24 to 34 inches; brown (10YR 5/3) clay loam; many coarse distinct yellowish brown (10YR 5/8) mottles; moderate coarse prismatic structure parting to moderate medium and coarse angular and subangular blocky; firm; few fine roots; thick continuous gray (10YR 5/1) clay films on faces of peds; few fine black (10YR 2/1) iron and manganese oxide stains; medium acid; clear smooth boundary.

B23t—34 to 40 inches; pale brown (10YR 6/3) clay loam; many coarse distinct brownish yellow (10YR 6/8) and few fine distinct dark gray (10YR 4/1) mottles; weak coarse prismatic structure parting to moderate medium subangular blocky; firm; few roots; thin discontinuous gray (10YR 6/1) clay films on faces of peds; few fine black (10YR 2/1) iron and manganese oxide stains; few fine prominent yellowish red (5YR 5/8) iron segregations; 1 percent gravel; slightly acid; clear smooth boundary.

B3t—40 to 49 inches; pale brown (10YR 6/3) clay loam; common medium distinct yellowish brown (10YR 5/8) mottles; moderate medium subangular blocky structure; firm; thin patchy gray (10YR 6/1) clay films on faces of peds; few patchy dark gray (10YR 4/1) organic clay coatings in old root channels; common coarse distinct yellowish red (5YR 5/8) iron segregations; 1 percent gravel; neutral; clear smooth boundary.

C—49 to 60 inches; mottled dark grayish brown (10YR 4/2) and yellowish brown (10YR 5/4) stratified sandy loam and loamy sand; massive; friable; 1 to 5 percent gravel; slight effervescence; mildly alkaline.

The solum typically is 36 to 55 inches thick.

The A horizon has hue of 10YR, value of 4 to 6, and chroma of 1 to 3. The B2t horizon has hue of 10YR, value of 4 to 6, and chroma of 1 to 4. It is clay loam, silty clay loam, sandy clay loam, or loam. The C horizon has hue of 10YR or 2.5Y, value of 4 to 6, and chroma of 1 to 4. It is stratified. Textures include loamy sand, sandy loam, loam, and silt loam. The C horizon is neutral to moderately alkaline.

Wilbur series

The Wilbur series consists of deep, moderately well drained, moderately permeable soils on flood plains. These soils formed in silty alluvium. Slopes range from 0 to 2 percent.

Wilbur soils are similar to Genesee soils and are adjacent to Haymond and Wakeland soils on the landscape. Genesee soils have more sand in the control section. Haymond soils have mottles lower in the control section and are in higher positions on the landscape. Wakeland soils have a grayer control section and are in lower positions on the landscape.

Typical pedon of Wilbur silt loam, in woods, 1,055 feet west and 1,190 feet south of the northeast corner of sec. 31, T. 11 N., R. 1 E.

Ap—0 to 5 inches; dark grayish brown (10YR 4/2) silt loam, pale brown (10YR 6/3) dry; weak medium granular structure; friable; many fine and medium roots; medium acid; abrupt smooth boundary.

C1—5 to 9 inches; brown (10YR 5/3) silt loam; weak medium subangular blocky structure; friable; many medium roots; slightly acid; clear smooth boundary.

C2—9 to 15 inches; brown (10YR 4/3) silt loam; few fine pale brown (10YR 6/3) mottles; weak fine and medium subangular blocky structure; friable; common fine roots; slightly acid; clear smooth boundary.

C3—15 to 30 inches; yellowish brown (10YR 5/4) silt loam; few fine distinct light brownish gray (10YR 6/2) mottles; weak fine and medium subangular blocky structure; friable; common fine and medium roots; slightly acid; clear smooth boundary.

C4—30 to 35 inches; yellowish brown (10YR 5/4) silt loam; common medium distinct light brownish gray

(10YR 6/2) mottles; weak medium subangular blocky structure; friable; slightly acid; clear smooth boundary.

C5—35 to 60 inches; yellowish brown (10YR 5/4) silt loam; common medium distinct light brownish gray (10YR 6/2) and pale brown (10YR 6/3) mottles; massive; friable; slightly acid.

The control section ranges from medium acid to neutral.

The Ap horizon has hue of 10YR, value of 4 or 5, and chroma of 2 or 3. The C horizon has hue of 10YR, value of 4 to 6, and chroma of 3 or 4.

Xenia series

The Xenia series consists of deep, moderately well drained, moderately slowly permeable soils on uplands. These soils formed in loess and in the underlying glacial till. Slopes range from 2 to 7 percent.

Xenia soils are similar to Ava, Fincastle, and Russell soils and are adjacent to Fincastle and Russell soils on the landscape. Ava soils have a fragipan. Fincastle soils have a grayer solum and are on flatter landforms. Russell soils do not have mottles in the upper part of the argillic horizon. They are in positions on the landscape similar to those of the Xenia soils.

Typical pedon of Xenia silt loam, 2 to 7 percent slopes, eroded, in a pasture, 1,850 feet east and 1,585 feet north of the southwest corner of sec. 3, T. 11 N., R. 2 E.

Ap—0 to 7 inches; brown (10YR 5/3) silt loam, pale brown (10YR 6/3) dry; moderate medium granular structure; friable; many fine roots; neutral; abrupt smooth boundary.

B1t—7 to 17 inches; yellowish brown (10YR 5/4) silty clay loam; moderate medium subangular blocky structure; firm; common fine roots; thin patchy dark brown (10YR 4/3) clay and thin patchy brown (10YR 5/3) silt films on faces of peds; medium acid; clear wavy boundary.

B21t—17 to 31 inches; yellowish brown (10YR 5/4) silty clay loam; common medium distinct light brownish gray (10YR 6/2) mottles; moderate medium subangular blocky structure; firm; common fine roots; thin discontinuous grayish brown (10YR 5/2) silt and clay films and thin patchy light gray (10YR 7/2) silt coatings on faces of peds; few fine very dark brown (10YR 2/2) iron and manganese oxide accumulations; strongly acid; clear wavy boundary.

B22t—31 to 38 inches; yellowish brown (10YR 5/4) silty clay loam; many medium distinct grayish brown (10YR 5/2) mottles; moderate medium subangular blocky structure; firm; few fine roots; thick continuous dark grayish brown (10YR 6/2) silt and clay films and thin patchy brown (10YR 4/3) clay films on faces of peds; common very dark brown (10YR 2/2) iron and manganese oxide accumulations; medium acid; clear wavy boundary.

IIB23t—38 to 51 inches; yellowish brown (10YR 5/4) clay loam; common medium grayish brown (10YR 5/2) mottles; moderate medium subangular blocky structure; firm; thin discontinuous dark grayish brown (10YR 4/2) silt and clay films on faces of peds; common very dark brown (10YR 2/2) iron and manganese oxide accumulations; neutral; clear wavy boundary.

IIB3t—51 to 56 inches; yellowish brown (10YR 5/4) loam; common medium grayish brown (10YR 5/2) mottles; weak medium subangular blocky structure; firm; thin patchy dark grayish brown (10YR 4/2) silt and clay films on faces of peds; slight effervescence; mildly alkaline; clear wavy boundary.

IIC—56 to 60 inches; yellowish brown (10YR 5/4) and pale brown (10YR 6/3) loam; thick platy rock structure; firm; 5 percent gravel and cobbles; strong effervescence; moderately alkaline.

The solum is 40 to 60 inches thick.

The A horizon has hue of 10YR, value of 3 to 5, and chroma of 2 to 4. The B2t horizon has hue of 10YR or 7.5YR, value of 4 to 6, and chroma of 2 to 4. The C horizon has hue of 10YR, value of 5 or 6, and chroma of 2 to 4. It is 2 to 5 percent gravel and cobbles.

Zanesville series

The Zanesville series consists of deep, well drained soils on uplands. These soils are moderately permeable in the upper part of the subsoil and slowly permeable in the fragipan. They formed in loess and in residuum of sandstone and siltstone. Slopes range from 2 to 12 percent.

Zanesville soils are similar to Cincinnati and Wellston soils and are adjacent to Berks, Gilpin, and Wellston soils on the landscape. Cincinnati soils have a thicker solum. Wellston soils do not have a fragipan. Berks soils have a thinner solum and do not have an argillic horizon. Gilpin soils have a thinner solum. Berks and Gilpin soils are steeper.

Typical pedon of Zanesville silt loam, 2 to 6 percent slopes, in woods, 1,190 feet west and 60 feet north of the southeast corner of sec. 33, T. 11 N., R. 1 E.

A1—0 to 4 inches; dark grayish brown (10YR 4/2) silt loam, light brownish gray (10YR 6/2) dry; weak fine and medium granular structure; friable; common fine and medium roots; slightly acid; clear wavy boundary.

A2—4 to 9 inches; dark yellowish brown (10YR 4/4) silt loam; moderate medium granular structure; friable; common fine and medium roots; medium acid; clear wavy boundary.

B1t—9 to 13 inches; brown (7.5YR 4/4) silt loam; moderate fine and medium subangular blocky

structure; friable; common fine and medium roots; thin patchy dark yellowish brown (10YR 4/4) clay films on faces of peds; strongly acid; clear wavy boundary.

B21t—13 to 18 inches; brown (7.5YR 4/4) silt loam; moderate fine and medium subangular blocky structure; firm; common fine and medium roots; thin patchy strong brown (7.5YR 5/6) clay films on faces of peds; strongly acid; clear wavy boundary.

B22t—18 to 25 inches; brown (7.5YR 4/4) silty clay loam; moderate medium subangular blocky structure; firm; few fine roots; thin patchy pale brown (10YR 6/3) silt and clay films on faces of peds; strongly acid; clear wavy boundary.

B23t—25 to 34 inches; dark brown (7.5YR 4/4) silt loam; moderate medium subangular blocky structure; firm; few fine roots; thin patchy very pale brown (10YR 7/3) clay films on faces of peds; strongly acid; clear wavy boundary.

Bx1—34 to 41 inches; dark brown (7.5YR 4/4) silt loam many coarse distinct gray (10YR 6/1) mottles; moderate very coarse prismatic structure; firm and brittle; few fine roots along cleavage plains; thin patchy dark yellowish brown (10YR 4/6) clay films on faces of peds; few very dark grayish brown (10YR 3/2) iron and manganese oxide accumulations; strongly acid; clear irregular boundary.

IIBx2—41 to 54 inches; dark brown (7.5YR 4/4) silt loam; strong very coarse prismatic structure parting to weak thick platy; firm and brittle; thin patchy yellowish brown (10YR 5/6) clay films on faces of peds; thick light gray (10YR 6/1) silt flows in vertical cracks; few fine sandstone fragments; very strongly acid; clear wavy boundary.

IIB3—54 to 56 inches; brown (7.5YR 4/4) clay loam; weak medium subangular blocky structure; firm; few fine sandstone fragments; very strongly acid; clear smooth boundary.

R—56 inches; fractured sandstone rock.

The solum is 45 to 60 inches thick. Sandstone, siltstone, or shale bedrock is at a depth of about 45 to 80 inches.

The A horizon has hue of 10YR, value of 4 or 5, and chroma of 2 to 4. The B2t horizon has hue of 10YR or 7.5YR, value of 4 to 6, and chroma of 4 to 6. It is silt loam or silty clay loam. The Bx horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 4 to 6. It is silt loam, silty clay loam, or clay loam. Some pedons have a C horizon. The C horizon, where present, has hue of 10YR, value of 4 or 5, and chroma of 3 to 6. It is loam that is 5 to 15 percent coarse fragments.

Zipp series

The Zipp series consists of deep, very poorly drained, very slowly permeable soils on lake plains and slack water terraces. These soils formed in calcareous clayey and silty sediment. Slopes range from 0 to 2 percent.

Zipp soils are similar to Montgomery soils and are adjacent to Patton, Rensselaer, and Whitaker soils on the landscape. The Montgomery soils have a mollic epipedon. The Patton soils have a mollic epipedon and less clay than the Zipp soils. The Rensselaer soils have a mollic epipedon and more sand. The Patton and Rensselaer soils are in positions on the landscape similar to those of the Zipp soils. The Whitaker soils have more sand and colors of higher chroma. They are in higher positions on the landscape than the Zipp soils.

Typical pedon of Zipp silty clay loam, in a cultivated field, 1,450 feet west and 2,375 feet south of the northeast corner of sec. 16, T. 13 N., R. 1 W.

Ap—0 to 6 inches; dark gray (10YR 4/1) silty clay loam, grayish brown (10YR 5/2) dry; moderate fine and medium granular structure; friable; few fine roots; thin patchy very dark gray (10YR 3/1) organic coatings on ped faces; medium acid; abrupt smooth boundary.

A12—6 to 11 inches; dark gray (10YR 4/1) silty clay loam; common fine distinct dark yellowish brown (10YR 4/6) and few fine distinct light gray (10YR 7/1) mottles; weak fine and medium subangular blocky structure; very firm; slightly acid; clear smooth boundary.

B21g—11 to 17 inches; gray (10YR 5/1) silty clay loam; common fine and medium distinct dark yellowish brown (10YR 4/6) mottles; weak coarse prismatic structure parting to moderate medium angular blocky; very firm; few black (10YR 2/1) blotches; neutral; clear smooth boundary.

B22g—17 to 21 inches; gray (N 5/) silty clay; many fine and medium distinct dark yellowish brown (10YR 4/6) mottles; weak coarse prismatic structure parting to moderate medium subangular and angular blocky; very firm; few fine and medium very dark brown (10YR 2/2) blotches; neutral; clear smooth boundary.

B23g—21 to 29 inches; dark gray (5Y 4/1) silty clay loam; many medium prominent yellowish brown (10YR 5/6) mottles; weak coarse prismatic structure parting to moderate medium subangular and angular blocky; very firm; few dark gray (N 4/) blotches; neutral; clear smooth boundary.

B24g—29 to 41 inches; gray (10YR 5/1) silty clay loam; many coarse distinct yellowish brown (10YR 5/6) mottles; weak coarse prismatic structure parting to moderate medium subangular blocky; very firm; mildly alkaline; clear smooth boundary.

C—41 to 60 inches; light gray (10YR 6/1) silty clay loam; many coarse distinct yellowish brown (10YR 5/6) mottles; massive; firm; mildly alkaline.

The solum typically is 30 to 45 inches thick, but it ranges from 28 to 48 inches in thickness.

The A horizon is dark gray (10YR 4/1) or dark grayish brown (10YR 4/2) silty clay loam or silty clay. The B2g horizon has hue of 10YR, 2.5YR, or 5Y, value of 4 to 6, and chroma of 2, or it has hue of N and value of 4 to 6. It is silty clay loam or silty clay. The C horizon has hue of 10YR or 2.5Y, value of 4 to 6, and chroma of 1. It is silty clay, clay, or silty clay loam.

formation of the soils

This section discusses the major factors of soil formation and their degree of importance in the formation of soils in Morgan County.

factors of soil formation

The characteristics of the soil at any given point are determined by (1) the physical and mineralogical composition of the parent material, (2) the climate under which the soil material has accumulated and existed since accumulation, (3) the plant and animal life on and in the soil, (4) the relief, or topography, of the land, and (5) the length of time the forces of soil formation have acted on the soil material.

Parent material affects the kind of soil profile that is formed and in extreme cases determines it almost entirely. Climate and plant and animal life, chiefly plants, are the active factors of soil formation. They act on the accumulated parent material and slowly change it to a natural body with genetically related horizons. Relief conditions the effects of climate and plant and animal life. Finally, time is needed to differentiate soil horizons and change the parent material into a soil profile. A longer time is generally required for the development of distinct horizons.

The factors of soil formation are so closely interrelated in their effects on the soil that few generalizations can be made regarding the effects of any one factor unless conditions are specified for the other four. Many of the processes of soil development are unknown.

parent material

Parent material is the unconsolidated mass from which a soil is formed. The parent materials of the soils in Morgan County were deposited by glaciers or the melt waters from glaciers; weathered in place from limestone, shale, and siltstone; or were deposited as windblown silt and sand. Some of these materials have been reworked and redeposited by subsequent actions of water and wind. Parent material determines the range of the chemical and mineralogical composition of the soil. The properties of parent materials of similar origin can vary greatly, sometimes within a small area, depending on how the materials were deposited. The dominant parent materials in Morgan County were deposited as glacial till, outwash deposits, lacustrine deposits, alluvium, residuum of bedrock, and windblown silt and sand.

Two glacial periods affected Morgan County, although some areas were unglaciated. The Illinoian glacial period occurred about 150,000 to 200,000 years ago and the Wisconsin glacial period about 20,000 years ago.

Glacial till is material laid down directly by glaciers with a minimum of water action. It consists of different-sized particles mixed together. Some of the small pebbles in glacial till have sharp corners, indicating that they have not been worn down by water. Soils formed in glacial till typically are medium textured and have well-developed structure. The glacial till in Morgan County is calcareous and firm and has loamy texture. Miami soils formed in glacial till of Wisconsinan age, and Hickory soils formed in glacial till of Illinoian age.

Outwash deposits consist of material that was laid down by running water from melting glaciers. The size of the deposited particles varies according to the speed of the stream that carried them. The coarser particles, sand and gravel, for example, were deposited when the water began to slow down. The finer particles, very fine sand, silt, and clay, for example, were carried on by the slower-moving water. Outwash deposits generally consist of layers of particles of similar size, dominantly sandy loam, sand, gravel, and other coarse particles. Fox soils formed in outwash deposits.

Lacustrine deposits consist of material that settled out from still or ponded glacial melt water. Because the coarser fragments are deposited by moving water as outwash, only the finer particles, very fine sand, silt, and clay, for example, remain to settle out in still water. Lacustrine deposits are silty or clayey in texture. Patton soils formed in lacustrine deposits.

Alluvium is material recently deposited by the floodwaters of present streams. Its texture varies, depending on the speed of the water from which it was deposited. The alluvium deposited along a swift stream, the White River, for example, is coarser than that deposited along a sluggish stream, Rhodes Creek, for example. Genesee and Wakeland soils formed in alluvium.

Bedrock is the solid rock that underlies the soil and other unconsolidated material or is exposed at the surface. The bedrock in Morgan County is sandstone, siltstone, shale, and limestone that was deposited by seas many millions of years ago. The soils that formed in residuum of this underlying bedrock are medium or fine textured. Berks soils formed in residuum of bedrock.

Windblown silt and sand consist of material that was carried by wind from stream valleys, where it had been

deposited by melt water from glaciers. The finer silt particles were carried farthest by the wind and deposited in a mantle that ranges from a few inches to 5 or more feet in thickness. Alford soils formed entirely in windblown silt. The heavier sand and coarse silt deposits were blown up and out of the valley of the White River onto adjacent uplands. Princeton and Bloomfield soils formed in windblown sand or in a mixture of sand and silt.

Some of the soils in Morgan County formed in two types of parent material. Fincastle soils formed in silt that was deposited over glacial till. Zanesville soils formed in silt that was deposited over residuum of sandstone.

plant and animal life

Plants have been the principal organisms influencing the soils in Morgan County. However, bacteria, fungi, earthworms, and man have also been important. Chiefly, plants and animals add organic matter and nitrogen to the soil. The kind of organic material in and on the soil depends on the plant varieties. Plant remains accumulate on and in the soil. The remains decay and eventually become organic matter. The roots of plants provide channels for downward movement of water through the soil and also add organic matter as they decay. Bacteria in the soil help break down the organic matter so that it can be used by growing plants.

The vegetation in Morgan County was once mainly deciduous forest. Differences in natural soil drainage and minor changes in parent material have affected the composition of the forest. In general, the well drained upland soils, Miami soils, for example, were covered mainly with sugar maple, beech, white oak, yellow-poplar, and sweet gum. The wet soils, Rensselaer and Brookston soils, for example, were covered mainly with pin oak, maple, sycamore, and ash. A few of the wet soils, Milford soils, for example, were also covered with sedges and water-loving grasses which contributed substantially to the accumulation of organic matter.

climate

Climate determines the kind of plant and animal life on and in the soil. It also determines the amount of water available for the weathering of minerals and for transporting soil material. Through its influence on soil temperature, climate affects the rate of chemical reaction in the soil. These influences are important, but their affect in a relatively small area such as a county is of minor importance.

The present climate of Morgan County is cool and humid and is presumably similar to that which existed when the soils formed. Soils that form in this kind of climate differ from the soils that form in a warm, dry climate or a hot, moist one. The climate is uniform throughout Morgan County, although its effects are modified locally by vegetative cover, topography, and elevation. Differences in the soils are, therefore, to a minor extent, the result of differences in climate.

relief

Relief, or topography, influences the natural drainage, erosion, plant cover, and temperature of soils. Slopes in Morgan County range from 0 to 80 percent, and the relief is complex.

Natural soil drainage ranges from well drained on the ridgetops to very poorly drained in the depressions. Runoff and drainage are greatest on the steeper soils. In low areas the soil tends to pond temporarily.

Drainage, through its effect on aeration of the soil, affects the color of the soil. Water and air move freely through soils that are well drained but slowly through soils that are very poorly drained. Iron and aluminum compounds are brightly colored and oxidized in well aerated soils, Martinsville soils, for example. However, these compounds are dull gray and mottled in poorly aerated soils, Rensselaer soils, for example.

time

Time is needed for distinct soil horizons to develop. Differences in the length of time that the parent material has been in place are commonly reflected in the degree of development of the soil profile. Some soils develop rapidly, others slowly.

The soils in Morgan County range from young to mature. Soils that formed in glacial deposits have distinct horizons because the parent material has been exposed to soil-forming factors for a long enough time to allow development. Soils that formed in recent alluvial sediment, however, have not been in place long enough for distinct horizons to develop. Genesee soils are soils that formed in alluvial material.

Miami and Crosby soils are older soils in which the effect of time on leaching of lime can be observed. The amount of lime in the solum was once about the same as the amount now in the C horizon. The difference in length of time of leaching is reflected by Rensselaer and Martinsville soils. Rensselaer soils were ponded or submerged under glacial lakes and outwash water and thus were protected from leaching. These soils are leached of lime to a depth of about 47 inches. In contrast, Martinsville soils were above water and were subject to leaching. They are therefore limy or calcareous at a depth of about 53 inches.

processes of soil formation

Several processes have been involved in the formation of the soils of Morgan County. These processes are the accumulation of organic matter; the solution, transfer, and removal of calcium carbonates and bases; the liberation and translocation of silicate clay minerals; and the reduction and transfer of iron. In most soils, more than one process has been active in horizon differentiation.

Some organic matter has accumulated in the surface layer of all the soils. The content of organic matter is low for some soils but high for others. Generally, the soils that have the most organic matter, Brookston and Rensselaer soils, for example, have a thick, black surface horizon.

Leaching of bases and translocation of silicate clays are among the most important processes in horizon differentiation in the soils of Morgan County. Leaching is generally believed to precede the translocation of silicate minerals.

Calcium carbonates and bases have been leached from the upper horizons of nearly all the soils in the county. Most of the carbonates and some of the bases have been leached from the A and B horizons of the well drained soils. In the wetter soils leaching takes place slowly because of a high water table or the slow movement of water through the soil. Even in the wettest soils, however, some leaching is indicated by the absence of carbonates and by an acid reaction.

Silicate clay minerals accumulate in pores and other voids and form films along which water moves. Miami soils are an example of soils in which translocated silicate clays have accumulated in the B2t horizon and formed clay films.

The reduction and transfer of iron, called gleying, is evident in all of the very poorly drained and somewhat poorly drained soils in the county. In the naturally wet soils, gleying has been significant in horizon differentiation. The gray color of the subsoil indicates the redistribution of iron oxides. Reduction is commonly accompanied by some transfer of iron. The iron moves from the upper horizons to the lower horizons or is completely removed from the profile. Some horizons have mottles, indicating segregation of iron.

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glossary

ABC soil. A soil having an A, a B, and a C horizon.

AC soil. A soil having only an A and a C horizon. Commonly such soil formed in recent alluvium or on steep rocky slopes.

Aeration, soil. The exchange of air in soil with air from the atmosphere. The air in a well aerated soil is similar to that in the atmosphere; the air in a poorly aerated soil is considerably higher in carbon dioxide and lower in oxygen.

Alluvium. Material, such as sand, silt, or clay, deposited on land by streams.

Available water capacity (available moisture capacity). The capacity of soils to hold water available for use by most plants. It is commonly defined as the difference between the amount of soil water at field moisture capacity and the amount at wilting point. It is commonly expressed as inches of water per inch of soil. The capacity, in inches, in a 60-inch profile or to a limiting layer is expressed as—

	Inches
Very low	0 to 3
Low	3 to 6
Moderate	6 to 9
High	9 to 12
Very high	More than 12

Base saturation. The degree to which material having cation exchange properties is saturated with exchangeable bases (sum of Ca, Mg, Na, K), expressed as a percentage of the total cation exchange capacity.

Bedrock. The solid rock that underlies the soil and other unconsolidated material or that is exposed at the surface.

Bottom land. The normal flood plain of a stream, subject to flooding.

Calcareous soil. A soil containing enough calcium carbonate (commonly combined with magnesium carbonate) to effervesce visibly when treated with cold, dilute hydrochloric acid.

Cation-exchange capacity. The total amount of exchangeable cations that can be held by the soil, expressed in terms of milliequivalents per 100 grams of soil at neutrality (pH 7.0) or at some other stated pH value. The term, as applied to soils, is synonymous with base-exchange capacity, but is more precise in meaning.

Channery soil. A soil that is, by volume, more than 15 percent thin, flat fragments of sandstone, shale, slate, limestone, or schist as much as 6 inches along the longest axis. A single piece is called a fragment.

Chiseling. Tillage with an implement having one or more soil-penetrating points that loosen the subsoil and bring clods to the surface. A form of emergency tillage to control soil blowing.

Clay. As a soil separate, the mineral soil particles less than 0.002 millimeter in diameter. As a soil textural class, soil material that is 40 percent or more clay, less than 45 percent sand, and less than 40 percent silt.

Clay film. A thin coating of oriented clay on the surface of a soil aggregate or lining pores or root channels. Synonyms: clay coating, clay skin.

Coarse fragments. If round, mineral or rock particles 2 millimeters to 25 centimeters (10 inches) in diameter; if flat, mineral or rock particles (flagstone) 15.2 to 38.1 centimeters (6 to 15 inches) long.

Coarse textured soil. Sand or loamy sand.

Cobblestone (or cobble). A rounded or partly rounded fragment of rock 3 to 10 inches (7.5 to 25 centimeters) in diameter.

Complex slope. Irregular or variable slope. Planning or constructing terraces, diversions, and other water-control measures on a complex slope is difficult.

Complex, soil. A map unit of two or more kinds of soil in such an intricate pattern or so small in area that it is not practical to map them separately at the selected scale of mapping. The pattern and proportion of the soils are somewhat similar in all areas.

Concretions. Grains, pellets, or nodules of various sizes, shapes, and colors consisting of concentrated compounds or cemented soil grains. The composition of most concretions is unlike that of the surrounding soil. Calcium carbonate and iron oxide are common compounds in concretions.

Conservation tillage. A tillage system that does not invert the soil and that leaves all or part of the crop residue on the surface throughout the year.

Consistence, soil. The feel of the soil and the ease with which a lump can be crushed by the fingers. Terms commonly used to describe consistence are—

Loose.—Noncoherent when dry or moist; does not hold together in a mass.

Friable.—When moist, crushes easily under gentle pressure between thumb and forefinger and can be pressed together into a lump.

Firm.—When moist, crushes under moderate pressure between thumb and forefinger, but resistance is distinctly noticeable.
Plastic.—When wet, readily deformed by moderate pressure but can be pressed into a lump; will form a "wire" when rolled between thumb and forefinger.
Sticky.—When wet, adheres to other material and tends to stretch somewhat and pull apart rather than to pull free from other material.
Hard.—When dry, moderately resistant to pressure; can be broken with difficulty between thumb and forefinger.
Soft.—When dry, breaks into powder or individual grains under very slight pressure.
Cemented.—Hard; little affected by moistening.

Contour stripcropping. Growing crops in strips that follow the contour. Strips of grass or close-growing crops are alternated with strips of clean-tilled crops or summer fallow.

Control section. The part of the soil on which classification is based. The thickness varies among different kinds of soil, but for many it is that part of the soil profile between depths of 10 inches and 40 or 80 inches.

Corrosive. High risk of corrosion to uncoated steel or deterioration of concrete.

Cover crop. A close-growing crop grown primarily to improve and protect the soil between periods of regular crop production or a crop grown between trees and vines in orchards and vineyards.

Cutbanks cave (in tables). The walls of excavations tend to cave in or slough.

Depth to rock (in tables). Bedrock is too near the surface for the specified use.

Diversion (or diversion terrace). A ridge of earth, generally a terrace, built to protect downslope areas by diverting runoff from its natural course.

Drainage class (natural). Refers to the frequency and duration of periods of saturation or partial saturation during soil formation, as opposed to altered drainage, which is commonly the result of artificial drainage or irrigation but may be caused by the sudden deepening of channels or the blocking of drainage outlets. Seven classes of natural soil drainage are recognized:
Excessively drained.—Water is removed from the soil very rapidly. Excessively drained soils are commonly very coarse textured, rocky, or shallow. Some are steep. All are free of the mottling related to wetness.
Somewhat excessively drained.—Water is removed from the soil rapidly. Many somewhat excessively drained soils are sandy and rapidly pervious. Some are shallow. Some are so steep that much of the water they receive is lost as runoff. All are free of the mottling related to wetness.
Well drained.—Water is removed from the soil readily, but not rapidly. It is available to plants throughout most of the growing season, and wetness does not inhibit growth of roots for significant periods during most growing seasons. Well drained soils are commonly medium textured. They are mainly free of mottling.
Moderately well drained.—Water is removed from the soil somewhat slowly during some periods. Moderately well drained soils are wet for only a short time during the growing season, but periodically they are wet long enough that most mesophytic crops are affected. They commonly have a slowly pervious layer within or directly below the solum, or periodically receive high rainfall, or both.
Somewhat poorly drained.—Water is removed slowly enough that the soil is wet for significant periods during the growing season. Wetness markedly restricts the growth of mesophytic crops unless artificial drainage is provided. Somewhat poorly drained soils commonly have a slowly pervious layer, a high water table, additional water from seepage, nearly continuous rainfall, or a combination of these.
Poorly drained.—Water is removed so slowly that the soil is saturated periodically during the growing season or remains wet for long periods. Free water is commonly at or near the surface for long enough during the growing season that most mesophytic crops cannot be grown unless the soil is artificially drained. The soil is not continuously saturated in layers directly below plow depth. Poor drainage results from a high water table, a slowly pervious layer within the profile, seepage, nearly continuous rainfall, or a combination of these.
Very poorly drained.—Water is removed from the soil so slowly that free water remains at or on the surface during most of the growing season. Unless the soil is artificially drained, most mesophytic crops cannot be grown. Very poorly drained soils are commonly level or depressed and are frequently ponded. Yet, where rainfall is high and nearly continuous, they can have moderate or high slope gradients.

Drainage, subsurface. Removal of excess ground water through buried drains installed within the soil profile. The drains collect the water and convey it to a gravity or pump outlet.

Drainage, surface. Runoff, or surface flow of water, from an area.

Eluviation. The movement of material in true solution or colloidal suspension from one place to another within the soil. Soil horizons that have lost material through eluviation are eluvial; those that have received material are illuvial.

Eolian soil material. Earthy parent material accumulated through wind action; commonly refers to sandy

material in dunes or to loess in blankets on the surface.

Erosion. The wearing away of the land surface by water, wind, ice, or other geologic agents and by such processes as gravitational creep.

Erosion (geologic). Erosion caused by geologic processes acting over long geologic periods and resulting in the wearing away of mountains and the building up of such landscape features as flood plains and coastal plains. Synonym: natural erosion.

Erosion (accelerated). Erosion much more rapid than geologic erosion, mainly as a result of the activities of man or other animals or of a catastrophe in nature, for example, fire, that exposes the surface.

Esker (geology). A narrow, winding ridge of stratified gravelly and sandy drift deposited by a stream flowing in a tunnel beneath a glacier.

Excess fines (in tables). Excess silt and clay in the soil. The soil does not provide a source of gravel or sand for construction purposes.

Fertility, soil. The quality that enables a soil to provide plant nutrients, in adequate amounts and in proper balance, for the growth of specified plants when light, moisture, temperature, tilth, and other growth factors are favorable.

Field moisture capacity. The moisture content of a soil, expressed as a percentage of the ovendry weight, after the gravitational, or free, water has drained away; the field moisture content 2 or 3 days after a soaking rain; also called *normal field capacity, normal moisture capacity,* or *capillary capacity.*

Fine textured soil. Sandy clay, silty clay, and clay.

Flood plain. A nearly level alluvial plain that borders a stream and is subject to flooding unless protected artificially.

Foot slope. The inclined surface at the base of a hill.

Fragipan. A loamy, brittle subsurface horizon low in porosity and content of organic matter and low or moderate in clay but high in silt or very fine sand. A fragipan appears cemented and restricts roots. When dry, it is hard or very hard and has a higher bulk density than the horizon or horizons above. When moist, it tends to rupture suddenly under pressure rather than to deform slowly.

Frost action (in tables). Freezing and thawing of soil moisture. Frost action can damage roads, buildings and other structures, and plant roots.

Genesis, soil. The mode of origin of the soil. Refers especially to the processes or soil-forming factors responsible for the formation of the solum, or true soil, from the unconsolidated parent material.

Glacial drift (geology). Pulverized and other rock material transported by glacial ice and then deposited. Also the sorted and unsorted material deposited by streams flowing from glaciers.

Glacial outwash (geology). Gravel, sand, and silt, commonly stratified, deposited by glacial melt water.

Glacial till (geology). Unsorted, nonstratified glacial drift consisting of clay, silt, sand, and boulders transported and deposited by glacial ice.

Glaciofluvial deposits (geology). Material moved by glaciers and subsequently sorted and deposited by streams flowing from the melting ice. The deposits are stratified and occur as kames, eskers, deltas, and outwash plains.

Glaciolacustrine deposits. Material ranging from fine clay to sand derived from glaciers and deposited in glacial lakes mainly by glacial melt water. Many deposits are interbedded or laminated.

Gleyed soil. Soil that formed under poor drainage, resulting in the reduction of iron and other elements in the profile and in gray colors and mottles.

Grassed waterway. A natural or constructed waterway, typically broad and shallow, seeded to grass as protection against erosion. Conducts surface water away from cropland.

Gravel. Rounded or angular fragments of rock up to 3 inches (2 millimeters to 7.5 centimeters) in diameter. An individual piece is a pebble.

Gravelly soil material. Material that is 15 to 50 percent, by volume, rounded or angular rock fragments, not prominently flattened, up to 3 inches (7.5 centimeters) in diameter.

Green manure crop (agronomy). A soil-improving crop grown to be plowed under in an early stage of maturity or soon after maturity.

Ground water (geology). Water filling all the unblocked pores of underlying material below the water table.

Gully. A miniature valley with steep sides cut by running water and through which water ordinarily runs only after rainfall. The distinction between a gully and a rill is one of depth. A gully generally is an obstacle to farm machinery and is too deep to be obliterated by ordinary tillage; a rill is of lesser depth and can be smoothed over by ordinary tillage.

Horizon, soil. A layer of soil, approximately parallel to the surface, having distinct characteristics produced by soil-forming processes. In the identification of soil horizons, an upper case letter represents the major horizons. Numbers or lower case letters that follow represent subdivisions of the major horizons. An explanation of the subdivisions is given in the *Soil Survey Manual.* The major horizons of mineral soil are as follows:

O horizon.—An organic layer of fresh and decaying plant residue at the surface of a mineral soil.

A horizon.—The mineral horizon at or near the surface in which an accumulation of humified organic matter is mixed with the mineral material. Also, a plowed surface horizon, most of which was originally part of a B horizon.

B horizon.—The mineral horizon below an A horizon. The B horizon is in part a layer of transition from the overlying A to the underlying C

horizon. The B horizon also has distinctive characteristics such as (1) accumulation of clay, sesquioxides, humus, or a combination of these; (2) prismatic or blocky structure; (3) redder or browner colors than those in the A horizon; or (4) a combination of these. The combined A and B horizons are generally called the solum, or true soil. If a soil does not have a B horizon, the A horizon alone is the solum.

C horizon.—The mineral horizon or layer, excluding indurated bedrock, that is little affected by soil-forming processes and does not have the properties typical of the A or B horizon. The material of a C horizon may be either like or unlike that in which the solum formed. If the material is known to differ from that in the solum, the Roman numeral II precedes the letter C.

R layer.—Consolidated rock beneath the soil. The rock commonly underlies a C horizon, but can be directly below an A or a B horizon.

Hydrologic soil groups. Refers to soils grouped according to their runoff-producing characteristics. The chief consideration is the inherent capacity of soil bare of vegetation to permit infiltration. The slope and the kind of plant cover are not considered but are separate factors in predicting runoff. Soils are assigned to four groups. In group A are soils having a high infiltration rate when thoroughly wet and having a low runoff potential. They are mainly deep, well drained, and sandy or gravelly. In group D, at the other extreme, are soils having a very slow infiltration rate and thus a high runoff potential. They have a claypan or clay layer at or near the surface, have a permanent high water table, or are shallow over nearly impervious bedrock or other material. A soil is assigned to two hydrologic groups if part of the acreage is artificially drained and part is undrained.

Impervious soil. A soil through which water, air, or roots penetrate slowly or not at all. No soil is absolutely impervious to air and water all the time.

Infiltration. The downward entry of water into the immediate surface of soil or other material, as contrasted with percolation, which is movement of water through soil layers or material.

Infiltration capacity. The maximum rate at which water can infiltrate into a soil under a given set of conditions.

Infiltration rate. The rate at which water penetrates the surface of the soil at any given instant, usually expressed in inches per hour. The rate can be limited by the infiltration capacity of the soil or the rate at which water is applied at the surface.

Irrigation. Application of water to soils to assist in production of crops. Methods of irrigation are—

Border.—Water is applied at the upper end of a strip in which the lateral flow of water is controlled by small earth ridges called border dikes, or borders.

Basin.—Water is applied rapidly to nearly level plains surrounded by levees or dikes.

Controlled flooding.—Water is released at intervals from closely spaced field ditches and distributed uniformly over the field.

Corrugation.—Water is applied to small, closely spaced furrows or ditches in fields of close-growing crops or in orchards so that it flows in only one direction.

Drip (or trickle).—Water is applied slowly and under low pressure to the surface of the soil or into the soil through such applicators as emitters, porous tubing, or perforated pipe.

Furrow.—Water is applied in small ditches made by cultivation implements. Furrows are used for tree and row crops.

Sprinkler.—Water is sprayed over the soil surface through pipes or nozzles from a pressure system.

Subirrigation.—Water is applied in open ditches or tile lines until the water table is raised enough to wet the soil.

Wild flooding.—Water, released at high points, is allowed to flow onto an area without controlled distribution.

Kame (geology). An irregular, short ridge or hill of stratified glacial drift.

Lacustrine deposit (geology). Material deposited in lake water and exposed when the water level is lowered or the elevation of the land is raised.

Large stones (in tables). Rock fragments 3 inches (7.5 centimeters) or more across. Large stones adversely affect the specified use of the soil.

Leaching. The removal of soluble material from soil or other material by percolating water.

Liquid limit. The moisture content at which the soil passes from a plastic to a liquid state.

Loam. Soil material that is 7 to 27 percent clay particles, 28 to 50 percent silt particles, and less than 52 percent sand particles.

Loess. Fine grained material, dominantly of silt-sized particles, deposited by wind.

Low strength. The soil is not strong enough to support loads.

Medium textured soil. Very fine sandy loam, loam, silt loam, or silt.

Mineral soil. Soil that is mainly mineral material and low in organic material. Its bulk density is more than that of organic soil.

Minimum tillage. Only the tillage essential to crop production and prevention of soil damage.

Miscellaneous area. An area that has little or no natural soil and supports little or no vegetation.

Moderately coarse textured soil. Sandy loam and fine sandy loam.

Moderately fine textured soil. Clay loam, sandy clay loam, and silty clay loam.

Parent material. The unconsolidated organic and mineral material in which soil forms.

Ped. An individual natural soil aggregate, such as a granule, a prism, or a block.

Pedon. The smallest volume that can be called "a soil." A pedon is three dimensional and large enough to permit study of all horizons. Its area ranges from about 10 to 100 square feet (1 square meter to 10 square meters), depending on the variability of the soil.

Percolation. The downward movement of water through the soil.

Percs slowly (in tables). The slow movement of water through the soil adversely affecting the specified use.

Permeability. The quality of the soil that enables water to move downward through the profile. Permeability is measured as the number of inches per hour that water moves downward through the saturated soil. Terms describing permeability are:

Very slow	less than 0.06 inch
Slow	0.06 to 0.20 inch
Moderately slow	0.2 to 0.6 inch
Moderate	0.6 inch to 2.0 inches
Moderately rapid	2.0 to 6.0 inches
Rapid	6.0 to 20 inches
Very rapid	more than 20 inches

Phase, soil. A subdivision of a soil series based on features that affect its use and management. For example, slope, stoniness, and thickness.

pH value. A numerical designation of acidity and alkalinity in soil. (See Reaction, soil.)

Piping (in tables). Formation of subsurface tunnels or pipelike cavities by water moving through the soil.

Plastic limit. The moisture content at which a soil changes from semisolid to plastic.

Poorly graded. Refers to a coarse grained soil or soil material consisting mainly of particles of nearly the same size. Because there is little difference in size of the particles, density can be increased only slightly by compaction.

Poor outlets (in tables). Refers to areas where surface or subsurface drainage outlets are difficult or expensive to install.

Productivity, soil. The capability of a soil for producing a specified plant or sequence of plants under specific management.

Profile, soil. A vertical section of the soil extending through all its horizons and into the parent material.

Reaction, soil. A measure of acidity or alkalinity of a soil, expressed in pH values. A soil that tests to pH 7.0 is described as precisely neutral in reaction because it is neither acid nor alkaline. The degree of acidity or alkalinity is expressed as—

	pH
Extremely acid	Below 4.5
Very strongly acid	4.5 to 5.0
Strongly acid	5.1 to 5.5
Medium acid	5.6 to 6.0
Slightly acid	6.1 to 6.5
Neutral	6.6 to 7.3
Mildly alkaline	7.4 to 7.8
Moderately alkaline	7.9 to 8.4
Strongly alkaline	8.5 to 9.0
Very strongly alkaline	9.1 and higher

Relief. The elevations or inequalities of a land surface, considered collectively.

Residuum (residual soil material). Unconsolidated, weathered, or partly weathered mineral material that accumulated as consolidated rock disintegrated in place.

Rill. A steep sided channel resulting from accelerated erosion. A rill is generally a few inches deep and not wide enough to be an obstacle to farm machinery.

Rock fragments. Rock or mineral fragments having a diameter of 2 millimeters or more; for example, pebbles, cobbles, stones, and boulders.

Rooting depth (in tables). Shallow root zone. The soil is shallow over a layer that greatly restricts roots.

Root zone. The part of the soil that can be penetrated by plant roots.

Runoff. The precipitation discharged into stream channels from an area. The water that flows off the surface of the land without sinking into the soil is called surface runoff. Water that enters the soil before reaching surface streams is called ground-water runoff or seepage flow from ground water.

Sand. As a soil separate, individual rock or mineral fragments from 0.05 millimeter to 2.0 millimeters in diameter. Most sand grains consist of quartz. As a soil textural class, a soil that is 85 percent or more sand and not more than 10 percent clay.

Sandstone. Sedimentary rock containing dominantly sand-size particles.

Seepage (in tables). The movement of water through the soil. Seepage adversely affects the specified use.

Shale. Sedimentary rock formed by the hardening of a clay deposit.

Sheet erosion. The removal of a fairly uniform layer of soil material from the land surface by the action of rainfall and runoff water.

Shrink-swell. The shrinking of soil when dry and the swelling when wet. Shrinking and swelling can damage roads, dams, building foundations, and other structures. It can also damage plant roots.

Silt. As a soil separate, individual mineral particles that range in diameter from the upper limit of clay (0.002 millimeter) to the lower limit of very fine sand (0.05 millimeter). As a soil textural class, soil that is 80 percent or more silt and less than 12 percent clay.

Siltstone. Sedimentary rock made up of dominantly silt-sized particles.

Site index. A designation of the quality of a forest site based on the height of the dominant stand at an arbitrarily chosen age. For example, if the average height attained by dominant and codominant trees in a fully stocked stand at the age of 50 years is 75 feet, the site index is 75 feet.

Slope. The inclination of the land surface from the horizontal. Percentage of slope is the vertical distance divided by horizontal distance, then multiplied by 100. Thus, a slope of 20 percent is a drop of 20 feet in 100 feet of horizontal distance.

Slow intake (in tables). The slow movement of water into the soil.

Slow refill (in tables). The slow filling of ponds, resulting from restricted permeability in the soil.

Small stones (in tables). Rock fragments less than 3 inches (7.5 centimeters) in diameter. Small stones adversely affect the specified use of the soil.

Soil. A natural, three-dimensional body at the earth's surface. It is capable of supporting plants and has properties resulting from the integrated effect of climate and living matter acting on earthy parent material, as conditioned by relief over periods of time.

Soil separates. Mineral particles less than 2 mm in equivalent diameter and ranging between specified size limits. The names and sizes of separates recognized in the United States are as follows:

	Millimeters
Very coarse sand	2.0 to 1.0
Coarse sand	1.0 to 0.5
Medium sand	0.5 to 0.25
Fine sand	0.25 to 0.10
Very fine sand	0.10 to 0.05
Silt	0.05 to 0.002
Clay	less than 0.002

Solum. The upper part of a soil profile, above the C horizon, in which the processes of soil formation are active. The solum in soil consists of the A and B horizons. Generally, the characteristics of the material in these horizons are unlike those of the underlying material. The living roots and plant and animal activities are largely confined to the solum.

Stones. Rock fragments 10 to 24 inches (25 to 60 centimeters) in diameter.

Stripcropping. Growing crops in a systematic arrangement of strips or bands which provide vegetative barriers to wind and water erosion.

Structure, soil. The arrangement of primary soil particles into compound particles or aggregates. The principal forms of soil structure are—*platy* (laminated), *prismatic* (vertical axis of aggregates longer than horizontal), *columnar* (prisms with rounded tops), *blocky* (angular or subangular), and *granular*. *Structureless* soils are either *single grained* (each grain by itself, as in dune sand) or *massive* (the particles adhering without any regular cleavage, as in many hardpans).

Stubble mulch. Stubble or other crop residue left on the soil or partly worked into the soil. It protects the soil from wind and water erosion after harvest, during preparation of a seedbed for the next crop, and during the early growing period of the new crop.

Subsoil. Technically, the B horizon; roughly, the part of the solum below plow depth.

Subsoiling. Tilling a soil below normal plow depth, ordinarily to shatter a hardpan or claypan.

Substratum. The part of the soil below the solum.

Subsurface layer. Any surface soil horizon (A1, A2, or A3) below the surface layer.

Surface soil. The horizon includes all substratum subdivisions of this horizon (A1, A2, and A3).

Taxadjuncts. Soils that cannot be classified in a series recognized in the classification system. Such soils are named for a series they strongly resemble and are designated as taxadjuncts to that series because they differ in ways too small to be of consequence in interpreting their use and behavior.

Terminal moraine. A belt of thick glacial drift that generally marks the termination of important glacial advances.

Terrace. An embankment, or ridge, constructed across sloping soils on the contour or at a slight angle to the contour. The terrace intercepts surface runoff so that water soaks into the soil or flows slowly to a prepared outlet. A terrace in a field is generally built so that the field can be farmed. A terrace intended mainly for drainage has a deep channel that is maintained in permanent sod.

Terrace (geologic). An old alluvial plain, ordinarily flat or undulating, bordering a river, a lake, or the sea.

Texture, soil. The relative proportions of sand, silt, and clay particles in a mass of soil. The basic textural classes, in order of increasing proportion of fine particles, are *sand, loamy sand, sandy loam, loam, silt loam, silt, sandy clay loam, clay loam, silty clay loam, sandy clay, silty clay,* and *clay*. The sand, loamy sand, and sandy loam classes may be further divided by specifying "coarse," "fine," or "very fine."

Thin layer (in tables). Otherwise suitable soil material too thin for the specified use.

Till plain. An extensive flat to undulating area underlain by glacial till.

Tilth, soil. The physical condition of the soil as related to tillage, seedbed preparation, seedling emergence, and root penetration.

Toe slope. The outermost inclined surface at the base of a hill; part of a foot slope.

Topsoil. The upper part of the soil, which is the most favorable material for plant growth. It is ordinarily rich in organic matter and is used to topdress roadbanks, lawns, and land affected by mining.

Underlying material. See Substratum.

Upland (geology). Land at a higher elevation, in general, than the alluvial plain or stream terrace; land above the lowlands along streams.

Variant, soil. A soil having properties sufficiently different from those of other known soils to justify a new series name, but occurring in such a limited geographic area that creation of a new series is not justified.

Weathering. All physical and chemical changes produced in rocks or other deposits at or near the earth's surface by atmospheric agents. These changes result in disintegration and decomposition of the material.

Well graded. Refers to soil material consisting of coarse grained particles that are well distributed over a wide range in size or diameter. Such soil normally can be easily increased in density and bearing properties by compaction. Contrasts with poorly graded soil.

tables

TABLE 1.--TEMPERATURE AND PRECIPITATION

[Recorded in the period 1951-74 at Greencastle, Ind.]

Month	Temperature						Precipitation				
	Average daily maximum	Average daily minimum	Average daily	2 years in 10 will have-- Maximum temperature higher than--	2 years in 10 will have-- Minimum temperature lower than--	Average number of growing degree days*	Average	2 years in 10 will have-- Less than--	2 years in 10 will have-- More than--	Average number of days with 0.10 inch or more	Average snowfall
	°F	°F	°F	°F	°F	Units	In	In	In		In
January----	35.6	18.0	26.8	64	-11	12	2.68	1.59	3.64	5	6.8
February---	40.0	21.1	30.6	66	-6	24	2.28	1.17	3.18	5	7.1
March------	49.6	29.6	39.6	80	8	140	3.50	1.93	4.77	7	5.8
April------	63.9	41.8	52.9	85	22	387	4.02	2.43	5.44	8	.7
May--------	74.1	51.2	62.7	91	31	704	4.42	2.71	5.95	8	.0
June-------	83.5	60.4	72.0	97	44	960	4.77	2.77	6.39	7	.0
July-------	87.0	63.6	75.3	99	48	1,094	4.08	2.15	5.65	6	.0
August-----	85.8	61.6	73.7	98	47	1,045	3.43	2.14	4.59	5	.0
September--	79.8	54.8	67.3	96	37	819	3.59	1.42	5.34	5	.0
October----	68.1	43.9	56.0	88	25	496	2.59	1.14	3.76	5	.1
November---	51.2	32.9	42.1	76	11	126	3.23	1.92	4.39	6	2.3
December---	39.3	23.2	31.2	68	-5	45	3.14	1.41	4.54	7	6.4
Yearly:											
Average-	63.2	41.8	52.5	---	---	---	---	---	---	---	---
Extreme	---	---	---	100	-12	---	---	---	---	---	---
Total---	---	---	---	---	---	5,852	41.73	36.71	46.58	74	29.2

*A growing degree day is a unit of heat available for plant growth. It can be calculated by adding the maximum and minimum daily temperatures, dividing the sum by 2, and subtracting the temperature below which growth is minimal for the principal crops in the area (40° F).

TABLE 2.--FREEZE DATES IN SPRING AND FALL

[Recorded in the period 1951-74 at Greencastle, Indiana]

Probability	Minimum temperature		
	24° F or lower	28° F or lower	32° F or lower
Last freezing temperature in spring:			
1 year in 10 later than--	April 10	April 23	May 6
2 years in 10 later than--	April 6	April 19	April 30
5 years in 10 later than--	March 29	April 11	April 20
First freezing temperature in fall:			
1 year in 10 earlier than--	October 27	October 16	October 3
2 years in 10 earlier than--	October 31	October 21	October 8
5 years in 10 earlier than--	November 7	October 30	October 18

TABLE 3.--GROWING SEASON

[Recorded in the period 1951-74 at Greencastle, Indiana]

Probability	Length of growing season if daily minimum temperature is--		
	Higher than 24° F	Higher than 28° F	Higher than 32° F
	Days	Days	Days
9 years in 10	205	181	159
8 years in 10	211	188	166
5 years in 10	223	201	180
2 years in 10	234	214	193
1 year in 10	240	220	200

TABLE 4.--POTENTIAL AND LIMITATIONS OF MAP UNITS ON THE GENERAL SOIL MAP

Map unit	Extent of area	Cultivated crops	Specialty crops	Woodland	Intensive recreation areas	Extensive recreation areas	Urban uses
	Pct						
1. Wakeland-Banlic-Wilbur	6	Good	Good	Good	Poor: flooding.	Poor: flooding.	Poor: flooding.
2. Genesee-Shoals	14	Good	Good	Good	Poor: flooding.	Poor: flooding.	Poor: flooding.
3. Rensselaer-Whitaker Martinsville	9	Good	Fair: wetness.	Good	Poor: wetness.	Poor: wetness.	Poor: wetness.
4. Patton-Whitaker	1	Good	Fair: wetness.	Good	Poor: wetness.	Poor: wetness.	Poor: wetness.
5. Crosby-Brookston	6	Good	Poor: wetness.	Good	Poor: wetness.	Poor: wetness.	Poor: wetness.
6. Miami-Crosby	13	Fair: slope.	Fair: slope.	Good	Good	Good	Fair: slope, wetness.
7. Miami-Fincastle-Xenia	12	Fair: slope.	Fair: slope.	Good	Good	Good	Fair: slope, wetness.
8. Fox-Ockley	2	Fair: droughty.	Good	Good	Good	Good	Good.
9. Princeton	3	Fair: slope.	Fair: slope.	Good	Good	Good	Fair: slope.
10. Alford-Grayford	2	Fair: slope.	Fair: slope.	Good	Good	Good	Fair: slope.
11. Alford-Hickory	1	Fair: slope.	Fair: slope.	Good	Fair: slope.	Fair: slope.	Fair: slope.
12. Parke-Chetwynd-Pike	5	Fair: slope.	Fair: slope.	Good	Fair: slope.	Fair: slope.	Fair: slope.
13. Hickory-Bedford	1	Poor: slope.	Poor: slope.	Good	Poor: slope.	Poor: slope.	Poor: slope.
14. Hickory-Cincinnati-Ava	10	Poor: slope.	Poor: slope.	Good	Poor: slope.	Poor: slope.	Poor: slope.
15. Vigo-Ava-Cincinnati	4	Fair: wetness, slope.	Fair: wetness, slope.	Good	Poor: wetness.	Poor: wetness.	Poor: wetness.
16. Berks-Gilpin-Zanesville	11	Poor: slope.	Poor: slope.	Fair: soil depth.	Poor: slope.	Poor: slope.	Poor: slope.

TABLE 5.--ACREAGE AND PROPORTIONATE EXTENT OF THE SOILS

Map symbol	Soil name	Acres	Percent
AfA	Alford silt loam, 0 to 2 percent slopes	300	0.1
AfB	Alford silt loam, 2 to 6 percent slopes	2,670	1.0
AfC2	Alford silt loam, 6 to 12 percent slopes, eroded	400	0.2
Ar	Armiesburg silty clay loam	1,905	0.7
AvB	Ava silt loam, 2 to 6 percent slopes	7,820	3.0
Ba	Banlic silt loam	3,475	1.3
Bd	Bartle silt loam	950	0.4
BeB	Bedford silt loam, 2 to 6 percent slopes	210	0.1
BeC2	Bedford silt loam, 6 to 12 percent slopes, eroded	265	0.1
BfG	Berks channery silt loam, 35 to 80 percent slopes	22,890	8.8
BmC	Bloomfield loamy fine sand, 6 to 12 percent slopes	380	0.1
Bo	Bonnie silt loam	375	0.1
Br	Brookston clay loam	7,940	3.1
ChF	Chetwynd loam, 18 to 80 percent slopes	4,215	1.6
CnC2	Cincinnati silt loam, 6 to 12 percent slopes, eroded	6,795	2.6
CnC3	Cincinnati silt loam, 6 to 12 percent slopes, severely eroded	250	0.1
CnD2	Cincinnati silt loam, 12 to 18 percent slopes, eroded	1,545	0.6
CnD3	Cincinnati silt loam, 12 to 18 percent slopes, severely eroded	425	0.2
CrA	Crosby silt loam, 0 to 2 percent slopes	10,810	4.2
CsB2	Crosby-Miami silt loams, 2 to 4 percent slopes, eroded	5,670	2.2
EsC2	Elkinsville silt loam, 6 to 12 percent slopes, eroded	460	0.2
Ev	Evansville silty clay loam	435	0.2
FcA	Fincastle silt loam, 0 to 3 percent slopes	9,350	3.6
FoA	Fox loam, 0 to 2 percent slopes	1,230	0.5
FoB2	Fox loam, 2 to 6 percent slopes, eroded	735	0.3
FxC2	Fox complex, 6 to 15 percent slopes, eroded	1,160	0.4
Ge	Genesee silt loam	23,535	9.1
GpC	Gilpin silt loam, 6 to 12 percent slopes	745	0.3
GpD	Gilpin silt loam, 12 to 18 percent slopes	2,855	1.1
GpE	Gilpin silt loam, 18 to 25 percent slopes	1,895	0.7
GrC	Grayford silt loam, 6 to 12 percent slopes	1,265	0.5
GrD2	Grayford silt loam, 12 to 18 percent slopes, eroded	240	0.1
Ha	Haymond silt loam	1,065	0.4
HkF	Hickory loam, 18 to 50 percent slopes	13,645	5.3
IvA	Iva silt loam, 0 to 3 percent slopes	1,245	0.5
MbD2	Markland silt loam, 12 to 18 percent slopes, eroded	530	0.2
MbE	Markland silt loam, 18 to 25 percent slopes	375	0.1
MeA	Martinsville loam, 0 to 2 percent slopes	5,735	2.2
MeB	Martinsville loam, 2 to 6 percent slopes	1,980	0.8
MnB2	Miami silt loam, 2 to 6 percent slopes, eroded	7,990	3.1
MnC2	Miami silt loam, 6 to 12 percent slopes, eroded	9,395	3.6
MnD2	Miami silt loam, 12 to 18 percent slopes, eroded	2,570	1.0
MnE	Miami silt loam, 18 to 25 percent slopes	2,065	0.8
MnF	Miami loam, 25 to 50 percent slopes	6,780	2.6
MoC3	Miami clay loam, 6 to 12 percent slopes, severely eroded	2,935	1.1
MoD3	Miami clay loam, 12 to 18 percent slopes, severely eroded	945	0.4
Mp	Milford silty clay loam	885	0.3
Mu	Montgomery silty clay loam	420	0.2
OcA	Ockley loam, 0 to 2 percent slopes	1,315	0.5
OcB2	Ockley loam, 2 to 6 percent slopes, eroded	295	0.1
PkC2	Parke silt loam, 6 to 12 percent slopes, eroded	3,170	1.2
PkD	Parke silt loam, 12 to 18 percent slopes	1,855	0.7
Pm	Patton silty clay loam	1,295	0.5
PnB	Pekin silt loam, 2 to 6 percent slopes	340	0.1
PpA	Pike silt loam, 0 to 2 percent slopes	955	0.4
PpB2	Pike silt loam, 2 to 6 percent slopes, eroded	1,080	0.4
PrA	Princeton fine sandy loam, 0 to 2 percent slopes	225	0.1
PrB	Princeton fine sandy loam, 2 to 6 percent slopes	1,395	0.5
PrC	Princeton fine sandy loam, 6 to 12 percent slopes	2,540	1.0
PrD	Princeton fine sandy loam, 12 to 18 percent slopes	1,135	0.4
PrE	Princeton fine sandy loam, 18 to 25 percent slopes	980	0.4
Ps	Pits	755	0.3
Rd	Reesville silt loam	340	0.1
Re	Rensselaer clay loam	8,110	3.1
Ro	Ross loam	1,060	0.4
RuB	Russell silt loam, 2 to 6 percent slopes	695	0.3
Sh	Shoals silt loam	10,000	3.8
Sn	Sloan silty clay loam	555	0.2
St	Stonelick sandy loam	1,385	0.5
Ta	Taggart silt loam	340	0.1
VoA	Vigo silt loam, 0 to 2 percent slopes	5,670	2.2
Wa	Wakeland silt loam	7,940	3.1

TABLE 5.--ACREAGE AND PROPORTIONATE EXTENT OF THE SOILS--Continued

Map symbol	Soil name	Acres	Percent
WcG	Weikert channery silt loam, 40 to 80 percent slopes	1,035	0.4
WfC	Wellston silt loam, 6 to 12 percent slopes	1,740	0.7
Wr	Whitaker loam	8,025	3.1
Wu	Wilbur silt loam	1,600	0.6
XeB2	Xenia silt loam, 2 to 7 percent slopes, eroded	4,980	1.9
ZaB	Zanesville silt loam, 2 to 6 percent slopes	520	0.2
ZaC	Zanesville silt loam, 6 to 12 percent slopes	2,425	0.9
Zp	Zipp silty clay loam	670	0.3
	Water	3,660	1.4
	Total	259,840	100.0

TABLE 6.--YIELDS PER ACRE OF CROPS AND PASTURE

[Yields are those that can be expected under a high level of management. Absence of a yield indicates that the soil is not suited to the crop or the crop generally is not grown on the soil]

Soil name and map symbol	Corn	Soybeans	Winter wheat	Grass-legume hay	Tall fescue
	Bu	Bu	Bu	Ton	AUM*
AfA---- Alford	125	44	50	4.1	8.2
AfB---- Alford	120	42	48	4.0	8.0
AfC2---- Alford	110	38	44	3.6	7.2
Ar---- Armiesburg	120	42	47	3.8	8.8
AvB---- Ava	100	33	48	4.3	7.1
Ba---- Banlic	115	37	46	4.2	8.4
Bd---- Bartle	110	38	50	3.6	7.2
BeB---- Bedford	95	33	43	3.1	6.2
BeC2---- Bedford	85	30	38	2.8	5.6
BfG---- Berks	---	---	---	---	---
BmC---- Bloomfield	75	29	39	3.0	6.0
Bo---- Bonnie	113	37	46	4.0	8.0
Br---- Brookston	145	51	65	4.8	9.6
ChF---- Chetwynd	---	---	---	---	---
CnC2---- Cincinnati	100	30	40	4.0	8.0
CnC3---- Cincinnati	90	20	35	3.5	7.0
CnD2---- Cincinnati	90	25	35	3.5	7.0
CnD3---- Cincinnati	80	---	25	3.0	6.0
CrA---- Crosby	105	37	47	3.4	6.8
CsB2---- Crosby-Miami	105	37	47	3.4	6.8
EsC2---- Elkinsville	105	37	42	3.4	6.8

See footnote at end of table.

TABLE 6.--YIELDS PER ACRE OF CROPS AND PASTURE--Continued

Soil name and map symbol	Corn	Soybeans	Winter wheat	Grass-legume hay	Tall fescue
	Bu	Bu	Bu	Ton	AUM*
Ev Evansville	145	51	58	4.8	9.6
FcA Fincastle	130	46	52	4.3	8.6
FoA Fox	95	32	45	4.5	9.0
FoB2 Fox	95	30	42	4.5	9.0
FxC2 Fox	90	28	38	4.0	8.0
Ge Genesee	105	37	---	3.5	8.0
GpC Gilpin	85	---	---	3.0	6.0
GpD Gilpin	80	---	---	2.5	5.0
GpE Gilpin	---	---	---	---	---
GrC Grayford	105	37	42	3.4	6.8
GrD2 Grayford	90	32	36	3.0	6.0
Ha Haymond	110	39	42	3.7	8.0
HkF Hickory	---	---	---	---	---
IvA Iva	135	47	54	4.4	8.8
MbD2 Markland	---	---	25	1.8	3.6
MbE Markland	---	---	18	1.3	2.6
MeA Martinsville	120	42	48	4.0	8.0
MeB Martinsville	120	42	48	4.0	8.0
MnB2 Miami	105	37	47	3.4	6.8
MnC2 Miami	95	33	43	3.1	6.2
MnD2 Miami	80	28	36	2.6	5.2
MnE Miami	---	---	---	---	4.6
MnF Miami	---	---	---	---	3.2

See footnote at end of table.

TABLE 6.--YIELDS PER ACRE OF CROPS AND PASTURE--Continued

Soil name and map symbol	Corn	Soybeans	Winter wheat	Grass-legume hay	Tall fescue
	Bu	Bu	Bu	Ton	AUM*
MoC3---------- Miami	90	32	40	3.0	6.0
MoD3---------- Miami	---	---	---	2.5	5.0
Mp---------- Milford	131	48	56	5.2	---
Mu---------- Montgomery	120	42	48	4.0	8.0
OcA---------- Ockley	110	38	44	3.6	7.2
OcB2---------- Ockley	105	37	42	3.4	6.8
PkC2---------- Parke	105	37	42	3.4	6.8
PkD---------- Parke	90	32	36	3.0	6.0
Pm---------- Patton	148	48	56	5.0	10.0
PnB---------- Pekin	105	37	47	3.4	6.8
PpA---------- Pike	120	42	48	4.0	8.0
PpB2---------- Pike	115	40	46	3.8	7.6
PrA---------- Princeton	100	35	45	3.3	6.6
PrB---------- Princeton	95	33	43	3.1	6.2
PrC---------- Princeton	85	30	38	2.8	5.6
PrD---------- Princeton	70	24	32	2.3	4.6
PrE---------- Princeton	---	---	---	2.0	4.0
Ps. Pits					
Rd---------- Reesville	135	40	48	4.5	9.0
Re---------- Rensselaer	150	53	60	5.0	10.0
Ro---------- Ross	130	44	50	5.0	8.8
RuB---------- Russell	120	42	48	4.0	8.0
Sh---------- Shoals	100	32	33	3.0	8.0

See footnote at end of table.

TABLE 6.--YIELDS PER ACRE OF CROPS AND PASTURE--Continued

Soil name and map symbol	Corn	Soybeans	Winter wheat	Grass-legume hay	Tall fescue
	Bu	Bu	Bu	Ton	AUM*
Sn---------- Sloan	---	---	---	---	---
St---------- Stonelick	80	28	---	3.5	7.0
Ta---------- Taggart	135	47	54	4.4	8.8
VoA---------- Vigo	110	38	50	3.6	7.2
Wa---------- Wakeland	115	40	46	4.4	8.8
WcG---------- Weikert	---	---	---	---	---
WfC---------- Wellston	85	---	40	4.0	8.0
Wr---------- Whitaker	125	44	50	4.1	8.2
Wu---------- Wilbur	110	44	50	4.1	8.2
XeB2---------- Xenia	115	40	46	3.8	7.6
ZaB---------- Zanesville	90	35	---	3.5	7.0
ZaC---------- Zanesville	80	30	---	3.5	7.0
Zp---------- Zipp	105	37	42	3.4	6.8

* Animal-unit-month: The amount of forage or feed required to feed one animal unit (one cow, one horse, one mule, five sheep, or five goats) for 30 days.

TABLE 7.--CAPABILITY CLASSES AND SUBCLASSES

[Miscellaneous areas are excluded. Absence of an entry indicates no acreage]

Class	Total acreage	Major management concerns (Subclass)			
		Erosion (e)	Wetness (w)	Soil problem (s)	Climate (c)
		Acres	Acres	Acres	Acres
I	8,305	---	---	---	---
II	143,810	36,380	105,975	1,455	---
III	33,210	30,360	2,850	---	---
IV	13,765	13,385	---	380	---
V	555	---	---	---	---
VI	7,215	7,215	---	---	---
VII	48,565	48,565	---	---	---
VIII	755	755	---	---	---

TABLE 8.--WOODLAND MANAGEMENT AND PRODUCTIVITY

[Only the soils suitable for production of commercial trees are listed. Absence of an entry indicates that information was not available]

Soil name and map symbol	Ordination symbol	Management concerns				Potential productivity		Trees to plant
		Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Common trees	Site index	
AfA, AfB, AfC2---- Alford	1o	Slight	Slight	Slight	Slight	White oak----------	90	Eastern white pine, red pine, black walnut, yellow-poplar, white ash.
						Yellow-poplar-------	98	
						Sweetgum-----------	76	
Ar---------- Armiesburg	1o	Slight	Slight	Slight	Slight	Yellow-poplar-------	100	Eastern white pine, black walnut, yellow-poplar.
						White oak----------	90	
						Black walnut--------	70	
AvB---------- Ava	2o	Slight	Slight	Slight	Slight	White oak----------	75	Black walnut, eastern cottonwood, sweetgum, yellow-poplar, white oak, American sycamore.
						Northern red oak----	80	
						Yellow-poplar-------	90	
						Black walnut--------	---	
Ba---------- Banlic	2o	Slight	Slight	Slight	Slight	White oak----------	75	Black walnut, sweetgum, white oak, yellow-poplar, American sycamore, green ash.
						Pin oak------------	90	
						Southern red oak----	85	
						Yellow-poplar-------	90	
						Black walnut--------	---	
Bd---------- Bartle	3o	Slight	Slight	Slight	Slight	White oak----------	75	Eastern white pine, white ash, red maple, yellow-poplar, American sycamore.
						Pin oak------------	85	
						Yellow-poplar-------	85	
						Sweetgum-----------	80	
BeB, BeC2---------- Bedford	3o	Slight	Slight	Slight	Slight	White oak----------	70	Eastern white pine, red pine, yellow-poplar, white ash.
						Northern red oak----	75	
						Yellow-poplar-------	90	
						Virginia pine-------	75	
						Sugar maple---------	75	
BfG---------- Berks	3f	Moderate	Severe	Moderate	Slight	Northern red oak----	70	Eastern white pine, red pine.
						Black oak----------	70	
						Virginia pine-------	70	
BmC---------- Bloomfield	3s	Slight	Slight	Moderate	Slight	Black oak----------	70	Eastern white pine, red pine.
						White oak----------	---	
						Scarlet oak---------	---	
Bo---------- Bonnie	2w	Slight	Severe	Severe	Severe	Pin oak------------	90	Eastern cottonwood, red maple, American sycamore, sweetgum, pin oak.
						Eastern cottonwood--	100	
						Sweetgum-----------	---	
						Cherrybark oak------	---	
						American sycamore---	---	
Br---------- Brookston	2w	Slight	Severe	Severe	Moderate	Pin oak------------	86	Red maple, white ash, sweetgum.
						White oak----------	75	
						Sweetgum-----------	90	
						Northern red oak----	78	
ChF---------- Chetwynd	1r	Severe	Severe	Slight	Slight	Yellow-poplar-------	99	Eastern white pine, black walnut, yellow-poplar, red pine.
						Northern red oak----	88	
CnC2, CnC3---------- Cincinnati	2d	Slight	Slight	Moderate	Moderate	Northern red oak----	80	Eastern white pine, black walnut, yellow-poplar.
						White oak----------	---	
						Black walnut--------	---	
						Black cherry--------	---	

TABLE 8.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordination symbol	Management concerns				Potential productivity		Trees to plant
		Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Common trees	Site index	
CnD2, CnD3---------- Cincinnati	2d	Moderate	Moderate	Moderate	Moderate	Northern red oak----	80	Eastern white pine, black walnut, yellow-poplar.
						White oak----------	---	
						Black walnut--------	---	
						Black cherry--------	---	
CrA---------- Crosby	3o	Slight	Slight	Slight	Slight	White oak----------	75	Eastern white pine, white ash, red maple, yellow-poplar, American sycamore.
						Pin oak------------	85	
						Yellow-poplar-------	85	
						Sweetgum-----------	80	
						Northern red oak----	75	
CsB2*: Crosby----------	3o	Slight	Slight	Slight	Slight	White oak----------	75	Eastern white pine, white ash, red maple, yellow-poplar, American sycamore.
						Pin oak------------	85	
						Yellow-poplar-------	85	
						Sweetgum-----------	80	
						Northern red oak----	75	
Miami----------	1o	Slight	Slight	Slight	Slight	White oak----------	90	Eastern white pine, red pine, white ash, yellow-poplar, black walnut.
						Yellow-poplar-------	98	
						Sweetgum-----------	76	
EsC2---------- Elkinsville	1o	Slight	Slight	Slight	Slight	White oak----------	90	Eastern white pine, red pine, white ash, yellow-poplar, black walnut.
						Yellow-poplar-------	98	
						Sweetgum-----------	76	
Ev---------- Evansville	2w	Slight	Severe	Moderate	Moderate	Pin oak------------	90	Red maple, white ash, sweetgum.
						White oak----------	75	
						Sweetgum-----------	90	
FcA---------- Fincastle	3o	Slight	Slight	Slight	Slight	Northern red oak----	75	Eastern white pine, white ash, red maple, yellow-poplar, American sycamore.
						White oak----------	75	
						Pin oak------------	85	
						Yellow-poplar-------	85	
						Sweetgum-----------	80	
FoA, FoB2, FxC2---- Fox	2o	Slight	Slight	Slight	Slight	Northern red oak----	80	Yellow-poplar, white ash, eastern white pine, red pine.
						White oak----------	---	
						Sugar maple--------	---	
Ge---------- Genesee	1o	Slight	Slight	Slight	Slight	Yellow-poplar-------	100	Eastern white pine, black walnut, yellow-poplar.
GpC, GpD---------- Gilpin	2o	Slight	Slight	Slight	Slight	Northern red oak----	73	Eastern white pine, black cherry, yellow-poplar.
						Yellow-poplar-------	95	
GpE---------- Gilpin	2r	Moderate	Moderate	Moderate	Slight	Northern red oak----	80	Eastern white pine, black cherry, yellow-poplar.
						Yellow-poplar-------	95	

See footnote at end of table.

TABLE 8.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordination symbol	Management concerns				Potential productivity		Trees to plant
		Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Common trees	Site index	
GrC, GrD2 Grayford	1o	Slight	Slight	Slight	Slight	White oak Yellow-poplar Sweetgum	90 98 76	Eastern white pine, red pine, black walnut, yellow-poplar, white ash.
Ha Haymond	1o	Slight	Slight	Slight	Slight	Yellow-poplar White oak Black walnut	100 90 70	Eastern white pine, black walnut, yellow-poplar.
HkF Hickory	1r	Severe	Severe	Slight	Slight	White oak Northern red oak Black oak Green ash Bitternut hickory Yellow-poplar	85 85 --- --- --- 95	Eastern white pine, red pine, yellow-poplar, sugar maple, white oak, black walnut.
IvA Iva	2w	Slight	Slight	Slight	Slight	White oak Pin oak Yellow-poplar Sweetgum	75 85 85 80	Eastern white pine, white ash, red maple, yellow-poplar, American sycamore.
MbD2 Markland	2c	Slight	Slight	Moderate	Slight	White oak Northern red oak	75 78	Eastern white pine, red pine, yellow-poplar, white ash.
MbE Markland	2c	Moderate	Moderate	Moderate	Slight	White oak Northern red oak	75 78	Eastern white pine, red pine, yellow-poplar, white ash.
MeA, MeB Martinsville	1o	Slight	Slight	Slight	Slight	White oak Yellow-poplar Sweetgum	90 98 76	Eastern white pine, red pine, white ash, yellow-poplar, black walnut.
MnB2, MnC2, MnD2 Miami	1o	Slight	Slight	Slight	Slight	White oak Yellow-poplar Sweetgum	90 98 76	Eastern white pine, red pine, white ash, yellow-poplar, black walnut.
MnE, MnF Miami	1r	Moderate	Moderate	Slight	Slight	White oak Yellow-poplar Sweetgum	90 98 76	Eastern white pine, red pine, white ash, yellow-poplar, black walnut.
MoC3, MoD3 Miami	1o	Slight	Slight	Slight	Slight	White oak Yellow-poplar Sweetgum	90 98 76	Eastern white pine, red pine, white ash, yellow-poplar, black walnut.
Mp Milford	---	---	---	---	---		---	Pin oak, green ash, red maple.
Mu Montgomery	2w	Slight	Severe	Severe	Severe	Pin oak White oak Sweetgum	88 75 90	Red maple, white ash, sweetgum.
OcA, OcB2 Ockley	1o	Slight	Slight	Slight	Slight	White oak Northern red oak Yellow-poplar Sweetgum	90 90 98 76	Eastern white pine, red pine, white ash, yellow-poplar, black walnut.

TABLE 8.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordination symbol	Management concerns				Potential productivity		Trees to plant
		Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Common trees	Site index	
PkC2, PkD--- Parke	1o	Slight	Slight	Slight	Slight	White oak	90	Eastern white pine, red pine, black walnut, yellow-poplar, white ash.
						Yellow-poplar	98	
						Sweetgum	76	
Pm--- Patton	2w	Slight	Severe	Moderate	Moderate	Pin oak	85	Red maple, white ash, sweetgum.
						White oak	75	
						Sweetgum	80	
						Northern red oak	75	
PnB--- Pekin	3o	Slight	Slight	Slight	Slight	White oak	70	Eastern white pine, red pine, yellow-poplar, white ash.
						Yellow-poplar	85	
						Virginia pine	75	
						Sugar maple	75	
PpA, PpB2--- Pike	1o	Slight	Slight	Slight	Slight	White oak	90	Eastern white pine, red pine, black walnut, yellow-poplar, white ash.
						Yellow-poplar	98	
						Sweetgum	76	
PrA, PrB, PrC, PrD--- Princeton	1o	Slight	Slight	Slight	Slight	White oak	90	Eastern white pine, red pine, black walnut, yellow-poplar, white ash.
						Yellow-poplar	98	
						Sweetgum	76	
PrE--- Princeton	1r	Moderate	Moderate	Slight	Slight	White oak	90	Eastern white pine, red pine, black walnut, yellow-poplar, white ash.
						Yellow-poplar	98	
						Sweetgum	76	
Rd--- Reesville	2o	Slight	Slight	Slight	Slight	Northern red oak	76	Eastern white pine, white ash, red maple.
						Yellow-poplar	86	
						Sugar maple	90	
Re--- Rensselaer	2w	Slight	Severe	Severe	Severe	Pin oak	86	Red maple, white ash, sweetgum.
						White oak	75	
						Sweetgum	90	
						Northern red oak	76	
Ro--- Ross	1o	Slight	Slight	Slight	Slight	Northern red oak	86	Eastern white pine, black walnut, white ash, yellow-poplar.
						Yellow-poplar	95	
						Sugar maple	85	
RuB--- Russell	1o	Slight	Slight	Slight	Slight	White oak	90	Eastern white pine, red pine, white ash, yellow-poplar, black walnut.
						Northern red oak	90	
						Yellow-poplar	98	
						Sweetgum	76	
Sh--- Shoals	2o	Slight	Slight	Slight	Slight	Pin oak	90	Sweetgum, red maple, swamp chestnut oak, pin oak, yellow-poplar.
						Sweetgum	86	
						Yellow-poplar	90	
						Virginia pine	90	
						Eastern cottonwood	---	
						White ash	---	
Sn--- Sloan	2w	Slight	Severe	Severe	Severe	Pin oak	86	Red maple, white ash, eastern cottonwood, pin oak.
						Swamp white oak	---	
						Red maple	---	
St--- Stonelick	2o	Slight	Slight	Slight	Slight	Northern red oak	80	Eastern white pine, black walnut, yellow-poplar.

TABLE 8.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordination symbol	Management concerns				Potential productivity		Trees to plant
		Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Common trees	Site index	
Ta---------- Taggart	3o	Slight	Slight	Slight	Slight	Northern red oak----	75	Eastern white pine, white ash, red maple, yellow-poplar, American sycamore.
						White oak----------	75	
						Pin oak----------	85	
						Yellow-poplar-------	85	
						Sweetgum----------	80	
VoA---------- Vigo	2w	Slight	Severe	Moderate	Moderate	Eastern cottonwood--	100	Red maple, sweetgum, white ash.
						Pin oak----------	90	
						Sweetgum----------	90	
						American sycamore---	---	
						White oak----------	---	
						Northern red oak----	---	
Wa---------- Wakeland	2o	Slight	Slight	Slight	Slight	Pin oak----------	90	Eastern white pine, American sycamore, red maple, white ash.
						Sweetgum----------	88	
						Yellow-poplar-------	90	
						Virginia pine-------	85	
WcG---------- Weikert	4d	Moderate	Severe	Severe	Moderate	Northern red oak----	64	Eastern white pine, Virginia pine.
						Virginia pine-------	60	
WfC---------- Wellston	2o	Slight	Slight	Slight	Slight	Northern red oak----	71	Eastern white pine, black walnut, yellow-poplar.
						Yellow-poplar-------	90	
						Virginia pine-------	70	
Wr---------- Whitaker	3o	Slight	Slight	Slight	Slight	White oak----------	70	Eastern white pine, white ash, red maple, yellow-poplar, American sycamore.
						Pin oak----------	85	
						Yellow-poplar-------	85	
						Sweetgum----------	80	
						Northern red oak----	75	
Wu---------- Wilbur	1o	Slight	Slight	Slight	Slight	Yellow-poplar-------	100	Eastern white pine, black walnut, yellow-poplar.
XeB2---------- Xenia	1o	Slight	Slight	Slight	Slight	White oak----------	90	Eastern white pine, red pine, black walnut, yellow-poplar, white ash.
						Yellow-poplar-------	98	
						Sweetgum----------	76	
ZaB, ZaC---------- Zanesville	3o	Slight	Slight	Slight	Slight	Northern red oak----	68	Eastern white pine.
						Virginia pine-------	70	
Zp---------- Zipp	2w	Slight	Severe	Severe	Severe	Pin oak----------	88	Red maple, white ash, sweetgum.
						White oak----------	75	
						Sweetgum----------	90	

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 9.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS

[The symbol < means less than; > means more than. Absence of an entry indicates that trees generally do not grow to the given height on that soil]

Soil name and map symbol	Trees having predicted 20-year average height, in feet, of--				
	<8	8-15	16-25	26-35	>35
AfA, AfB, AfC2---- Alford	Mockorange--------	European burningbush, blackhaw, late lilac, Amur honeysuckle, shadblow serviceberry, American cranberrybush, autumn-olive.	Eastern hemlock---	Norway spruce-----	Eastern white pine, honeylocust.
Ar---------- Armiesburg	Mockorange--------	European burningbush, blackhaw, late lilac, Amur honeysuckle, shadblow serviceberry, American cranberrybush, autumn-olive.	Eastern hemlock---	Norway spruce-----	Eastern white pine, honeylocust.
AvB---------- Ava	Redosier dogwood, gray dogwood, arrowwood.	Silky dogwood, autumn-olive.	Amur maple, eastern redcedar, flowering dogwood.	Eastern white pine, Norway spruce, Douglas-fir.	Eastern cottonwood.
Ba---------- Banlic	Arrowwood, gray dogwood, redosier dogwood.	Autumn-olive, silky dogwood.	Amur maple, eastern redcedar, flowering dogwood.	Eastern white pine, Norway spruce, Douglas-fir.	Eastern cottonwood.
Bd---------- Bartle	Cutleaf staghorn sumac.	Blackhaw, arrowwood, cornelian cherry dogwood, rose-of-sharon, Amur honeysuckle, American cranberrybush, autumn-olive.	---	American basswood, Norway spruce, white spruce.	Eastern white pine.
BeB, BeC2--------- Bedford	Cutleaf staghorn sumac.	Blackhaw, arrowwood, cornelian cherry dogwood, rose-of-sharon, Amur honeysuckle, American cranberrybush, autumn-olive.	---	Eastern white pine, Norway spruce, white spruce.	American basswood.
BfG. Berks					
BmC---------- Bloomfield	Vanhoutte spirea, gray dogwood, indiancurrant coralberry.	Eastern redcedar, autumn-olive, roughleaf dogwood.	Norway spruce, eastern white pine.	---	---
Bo---------- Bonnie	Arrowwood, redosier dogwood, gray dogwood.	Silky dogwood, forsythia.	Amur maple, baldcypress.	Green ash---------	Eastern cottonwood, American sycamore.

TABLE 9.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Soil name and map symbol	Trees having predicted 20-year average height, in feet, of--				
	<8	8-15	16-25	26-35	>35
Br---------- Brookston	Gray dogwood------	Redosier dogwood, Amur honeysuckle, silky dogwood.	Northern white-cedar, tall purple willow, Siberian crabapple.	---	Green ash.
ChF---------- Chetwynd	---	European burningbush, blackhaw, late lilac, Amur honeysuckle, shadblow serviceberry, American cranberrybush, autumn-olive.	Eastern hemlock---	Norway spruce-----	Honeylocust, eastern white pine.
CnC2, CnC3, CnD2, CnD3---------- Cincinnati	---	Winged euonymus, autumn-olive, Tatarian honeysuckle, nannyberry viburnum, forsythia.	Norway spruce, Scotch pine, red pine.	Austrian pine, eastern white pine.	---
CrA---------- Crosby	Cutleaf staghorn sumac.	Blackhaw, arrowwood, cornelian cherry dogwood, rose-of-sharon, Amur honeysuckle, American cranberrybush, autumn-olive.	---	American basswood, Norway spruce, white spruce.	Eastern white pine.
CsB2*: Crosby----------	Cutleaf staghorn sumac.	Blackhaw, arrowwood, cornelian cherry dogwood, rose-of-sharon, Amur honeysuckle, American cranberrybush, autumn-olive.	---	American basswood, Norway spruce, white spruce.	Eastern white pine.
Miami----------	---	Blackhaw, late lilac, Amur honeysuckle, shadblow serviceberry, winged euonymus, American cranberrybush, autumn-olive.	Eastern hemlock, European burningbush.	Norway spruce-----	Eastern white pine, honeylocust.
EsC2---------- Elkinsville	Mockorange--------	European burningbush, blackhaw, late lilac, Amur honeysuckle, shadblow serviceberry, American cranberrybush, autumn-olive.	Eastern hemlock---	Norway spruce-----	Honeylocust, eastern white pine.

See footnote at end of table.

TABLE 9.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Soil name and map symbol	Trees having predicted 20-year average height, in feet, of--				
	<8	8-15	16-25	26-35	>35
Ev---------- Evansville	Gray dogwood------	Amur honeysuckle, redosier dogwood, silky dogwood.	Northern white-cedar, tall purple willow.	---	---
FcA---------- Fincastle	Cutleaf staghorn sumac.	Blackhaw, arrowwood, cornelian cherry dogwood, rose-of-sharon, Amur honeysuckle, American cranberrybush, autumn-olive.	---	American basswood, Norway spruce, white spruce.	Eastern white pine.
FoA, FoB2, FxC2*-- Fox	---	Autumn-olive, Amur honeysuckle, blackhaw, American cranberrybush, cornelian cherry dogwood.	---	Norway spruce, white spruce, American basswood.	Eastern white pine.
Ge---------- Genesee	Mockorange--------	European burningbush, blackhaw, late lilac, Amur honeysuckle, American cranberrybush, autumn-olive.	---	Norway spruce-----	Eastern white pine, honeylocust.
GpC, GpD, GpE----- Gilpin	Mockorange--------	European burningbush, blackhaw, late lilac, Amur honeysuckle, shadblow serviceberry, American cranberrybush, autumn-olive.	Eastern hemlock---	---	Honeylocust, eastern white pine, Norway spruce.
GrC, GrD2--------- Grayford	Mockorange--------	European burningbush, blackhaw, late lilac, Amur honeysuckle, shadblow serviceberry, American cranberrybush, autumn-olive.	Eastern hemlock---	Norway spruce-----	Eastern white pine, honeylocust.
Ha---------- Haymond	Mockorange--------	European burningbush, blackhaw, late lilac, Amur honeysuckle, shadblow serviceberry, American cranberrybush, autumn-olive.	Eastern hemlock---	Eastern white pine, Norway spruce, honeylocust.	---
HkF. Hickory					

See footnote at end of table.

TABLE 9.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Soil name and map symbol	Trees having predicted 20-year average height, in feet, of--				
	<8	8-15	16-25	26-35	>35
IvA---------- Iva	Cutleaf staghorn sumac.	Blackhaw, arrowwood, cornelian cherry dogwood, rose-of-sharon, Amur honeysuckle, American cranberrybush, autumn-olive.	---	American basswood, Norway spruce, white spruce.	Eastern white pine.
MbD2, MbE---------- Markland	Cutleaf staghorn sumac.	Blackhaw, arrowwood, cornelian cherry dogwood, rose-of-sharon, Amur honeysuckle, American cranberrybush, autumn-olive.	---	American basswood, Norway spruce, white spruce.	Eastern white pine.
MeA, MeB---------- Martinsville	Mockorange--------	European burningbush, blackhaw, late lilac, Amur honeysuckle, shadblow serviceberry, American cranberrybush, autumn-olive.	Eastern hemlock---	Norway spruce------	Eastern white pine, honeylocust.
MnB2, MnC2, MnD2-- Miami	---	Blackhaw, late lilac, Amur honeysuckle, winged euonymus, American cranberrybush, autumn-olive.	Eastern hemlock, European burningbush.	Norway spruce------	Eastern white pine, honeylocust.
MnE, MnF. Miami					
MoC3, MoD3-------- Miami	---	Blackhaw, late lilac, Amur honeysuckle, shadblow serviceberry, winged euonymus, American cranberrybush, autumn-olive.	Eastern hemlock, European burningbush.	Norway spruce------	Eastern white pine, honeylocust.
Mp---------- Milford	Redosier dogwood, gray dogwood.	Amur maple, silky dogwood.	Russian-olive, baldcypress.	Green ash, Norway spruce.	Eastern cottonwood, pin oak, American sycamore.
Mu---------- Montgomery	Gray dogwood------	Redosier dogwood, silky dogwood, Amur honeysuckle, medium purple willow.	Northern white-cedar, tall purple willow.	---	---
OcA, OcB2---------- Ockley	---	Autumn-olive, American cranberrybush, late lilac, Tatarian honeysuckle.	White spruce------	Eastern white pine, Norway spruce.	Carolina poplar.

TABLE 9.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Soil name and map symbol	Trees having predicted 20-year average height, in feet, of--				
	<8	8-15	16-25	26-35	>35
PkC2, PkD--------- Parke	Mockorange--------	European burningbush, blackhaw, late lilac, Amur honeysuckle, shadblow serviceberry, American cranberrybush, autumn-olive.	Eastern hemlock---	Norway spruce-----	Eastern white pine, honeylocust.
Pm---------- Patton	Gray dogwood, redosier dogwood.	Amur maple, silky dogwood, oriental arborvitae.	Russian-olive-----	Green ash, Norway spruce.	Eastern cottonwood, American sycamore.
PnB---------- Pekin	Cutleaf staghorn sumac.	Blackhaw, arrowwood, cornelian cherry dogwood, rose-of-sharon, Amur honeysuckle, American cranberrybush, autumn-olive.	---	American basswood, Norway spruce, white spruce.	Eastern white pine.
PpA, PpB2--------- Pike	Mockorange--------	European burningbush, blackhaw, late lilac, Amur honeysuckle, shadblow serviceberry, American cranberrybush, autumn-olive.	Eastern hemlock---	Norway spruce-----	Honeylocust, eastern white pine.
PrA, PrB, PrC, PrD, PrE--------- Princeton	Mockorange--------	European burningbush, blackhaw, late lilac, Amur honeysuckle, shadblow serviceberry, American cranberrybush, autumn-olive.	Eastern hemlock---	Norway spruce-----	Eastern white pine, honeylocust.
Ps. Pits					
Rd---------- Reesville	Cutleaf staghorn sumac.	Blackhaw, arrowwood, cornelian cherry dogwood, rose-of-sharon, Amur honeysuckle, American cranberrybush, autumn-olive.	---	American basswood, Norway spruce, white spruce.	Eastern white pine.
Re---------- Rensselaer	Gray dogwood------	Redosier dogwood, Amur honeysuckle, silky dogwood.	Northern white-cedar, tall purple willow.	---	---

See footnote at end of table.

TABLE 9.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Soil name and map symbol	Trees having predicted 20-year average height, in feet, of--				
	<8	8-15	16-25	26-35	>35
Ro---------- Ross	Mockorange--------	European burningbush, blackhaw, late lilac, Amur honeysuckle, shadblow serviceberry, American cranberrybush, autumn-olive.	Eastern hemlock---	Norway spruce-----	Honeylocust, eastern white pine.
RuB---------- Russell	Mockorange--------	European burningbush, blackhaw, late lilac, Amur honeysuckle, shadblow serviceberry, American cranberrybush, autumn-olive.	Eastern hemlock---	Norway spruce-----	Eastern white pine, honeylocust.
Sh---------- Shoals	Gray dogwood------	Redosier dogwood, silky dogwood, Amur honeysuckle.	Northern white-cedar, tall purple willow.	---	---
Sn---------- Sloan	---	Redosier dogwood, gray dogwood, silky dogwood.	European alder, northern white-cedar, black willow.	---	---
St---------- Stonelick	Tatarian honeysuckle, Amur honeysuckle, wayfaringtree, winged euonymus.	Scotch pine, nannyberry viburnum, autumn-olive.	Austrian pine, eastern redcedar, red pine.	Eastern white pine	---
Ta---------- Taggart	Cutleaf staghorn sumac.	Blackhaw, arrowwood, cornelian cherry dogwood, rose-of-sharon, Amur honeysuckle, American cranberrybush, autumn-olive.	---	American basswood, Norway spruce, white spruce.	Eastern white pine.
VoA---------- Vigo	Gray dogwood------	Amur honeysuckle, redosier dogwood, silky dogwood.	Northern white-cedar, tall purple willow.	---	---
Wa---------- Wakeland	Gray dogwood------	Amur honeysuckle, redosier dogwood, silky dogwood.	Northern white-cedar, tall purple willow.	---	---
WcG---------- Weikert	American hazel, flowering quince.	Blackhaw, cutleaf staghorn sumac, forsythia, autumn-olive.	Jack pine, Austrian pine, Russian-olive.	Virginia pine, red pine, scarlet oak.	---
WfC---------- Wellston	---	Forsythia, Tatarian honeysuckle, winged euonymus, nannyberry viburnum, autumn-olive.	Norway spruce, Scotch pine, red pine.	Eastern white pine, Austrian pine.	---

See footnote at end of table.

TABLE 9.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Soil name and map symbol	Trees having predicted 20-year average height, in feet, of--				
	<8	8-15	16-25	26-35	>35
Wr---------- Whitaker	---	Autumn-olive, Amur honeysuckle, American cranberrybush, blackhaw, shadblow serviceberry, arrowwood, cornelian cherry dogwood, rose-of-sharon.	---	Norway spruce, white spruce, American basswood.	Eastern white pine.
Wu---------- Wilbur	Mockorange--------	European burningbush, blackhaw, late lilac, Amur honeysuckle, shadblow serviceberry, American cranberrybush, autumn-olive.	---	Norway spruce, honeylocust, eastern hemlock.	Eastern white pine.
XeB2---------- Xenia	Mockorange--------	European burningbush, blackhaw, late lilac, Amur honeysuckle, shadblow serviceberry, American cranberrybush, autumn-olive.	Eastern hemlock---	Norway spruce-----	Eastern white pine, honeylocust.
ZaB, ZaC---------- Zanesville	Cutleaf staghorn sumac.	Blackhaw, arrowwood, cornelian cherry dogwood, rose-of-sharon, Amur honeysuckle, American cranberrybush, autumn-olive.	---	American basswood, Norway spruce, white spruce.	Eastern white pine.
Zp---------- Zipp	Gray dogwood------	Amur honeysuckle, redosier dogwood, silky dogwood.	Northern white-cedar, tall purple willow.	---	---

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 10.--RECREATIONAL DEVELOPMENT

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
AfA---------- Alford	Slight----------	Slight----------	Slight----------	Severe: erodes easily.	Slight.
AfB---------- Alford	Slight----------	Slight----------	Moderate: slope.	Severe: erodes easily.	Slight.
AfC2---------- Alford	Moderate: slope.	Moderate: slope.	Severe: slope.	Severe: erodes easily.	Moderate: slope.
Ar---------- Armiesburg	Severe: floods.	Moderate: floods.	Severe: floods.	Moderate: floods.	Severe: floods.
AvB---------- Ava	Severe: percs slowly.	Severe: percs slowly.	Severe: percs slowly.	Severe: erodes easily.	Slight.
Ba---------- Banlic	Severe: floods, wetness.	Moderate: wetness, percs slowly.	Moderate: wetness, percs slowly.	Moderate: wetness.	Moderate: wetness.
Bd---------- Bartle	Severe: wetness, percs slowly.	Severe: percs slowly.	Severe: wetness, percs slowly.	Severe: erodes easily.	Moderate: wetness.
BeB---------- Bedford	Severe: percs slowly.	Severe: percs slowly.	Severe: percs slowly.	Severe: erodes easily.	Slight.
BeC2---------- Bedford	Severe: percs slowly.	Severe: percs slowly.	Severe: slope, percs slowly.	Severe: erodes easily.	Moderate: slope.
BfG---------- Berks	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Severe: slope.	Severe: slope.
BmC---------- Bloomfield	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight----------	Moderate: droughty, slope.
Bo---------- Bonnie	Severe: floods, wetness.	Severe: wetness.	Severe: wetness, floods.	Severe: wetness, erodes easily.	Severe: wetness, floods.
Br---------- Brookston	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
ChF---------- Chetwynd	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
CnC2, CnC3---------- Cincinnati	Moderate: slope, percs slowly.	Moderate: slope, percs slowly.	Severe: slope.	Severe: erodes easily.	Moderate: slope.
CnD2, CnD3---------- Cincinnati	Severe: slope.	Severe: slope.	Severe: slope.	Severe: erodes easily.	Severe: slope.
CrA---------- Crosby	Severe: wetness.	Moderate: wetness, percs slowly.	Severe: wetness.	Severe: erodes easily.	Moderate: wetness.
CsB2*: Crosby----------	Severe: wetness.	Moderate: wetness, percs slowly.	Severe: wetness.	Severe: erodes easily.	Moderate: wetness.

See footnote at end of table.

TABLE 10.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
CsB2*: Miami	Moderate: percs slowly.	Moderate: percs slowly.	Moderate: slope, percs slowly.	Slight	Slight.
EsC2 Elkinsville		Moderate: slope.	Severe: slope.	Severe: erodes easily.	Moderate: slope.
Ev Evansville	Severe: floods, ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding, erodes easily.	Severe: ponding.
FcA Fincastle	Severe: wetness.	Moderate: wetness, percs slowly.	Severe: wetness.	Severe: erodes easily.	Moderate: wetness.
FoA Fox	Slight	Slight	Moderate: small stones.	Slight	Slight.
FoB2 Fox	Slight	Slight	Moderate: slope, small stones.	Slight	Slight.
FxC2*: Fox	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: slope.
Ge Genesee	Severe: floods.	Moderate: floods.	Severe: floods.	Moderate: floods.	Severe: floods.
GpC Gilpin	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: slope, depth to rock.
GpD, GpE Gilpin	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
GrC Grayford	Moderate: slope.	Moderate: slope.	Severe: slope.	Severe: erodes easily.	Moderate: slope.
GrD2 Grayford	Severe: slope.	Severe: slope.	Severe: slope.	Severe: erodes easily.	Severe: slope.
Ha Haymond	Severe: floods.	Moderate: floods.	Severe: floods.	Severe: erodes easily.	Severe: floods.
HkF Hickory	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope, erodes easily.	Severe: slope.
IvA Iva	Severe: wetness.	Moderate: wetness, percs slowly.	Severe: wetness.	Severe: erodes easily.	Moderate: wetness.
MbD2, MbE Markland	Severe: slope.	Severe: slope.	Severe: slope.	Severe: erodes easily.	Severe: slope.
MeA Martinsville	Slight	Slight	Slight	Severe: erodes easily.	Slight.
MeB Martinsville	Slight	Slight	Moderate: slope.	Severe: erodes easily.	Slight.
MnB2 Miami	Moderate: percs slowly.	Moderate: percs slowly.	Moderate: slope, percs slowly.	Slight	Slight.

See footnote at end of table.

TABLE 10.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
MnC2---------- Miami	Moderate: slope, percs slowly.	Moderate: slope, percs slowly.	Severe: slope.	Slight----------	Moderate: slope.
MnD2, MnE---------- Miami	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
MnF---------- Miami	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
MoC3---------- Miami	Moderate: slope, percs slowly.	Moderate: slope, percs slowly.	Severe: slope.	Slight----------	Moderate: slope.
MoD3---------- Miami	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
Mp---------- Milford	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
Mu---------- Montgomery	Severe: ponding, percs slowly.	Severe: ponding, percs slowly.	Severe: ponding, percs slowly.	Severe: ponding, erodes easily.	Severe: ponding.
OcA---------- Ockley	Slight----------	Slight----------	Slight----------	Severe: erodes easily.	Slight.
OcB2---------- Ockley	Slight----------	Slight----------	Moderate: slope.	Severe: erodes easily.	Slight.
PkC2---------- Parke	Moderate: slope.	Moderate: slope.	Severe: slope.	Severe: erodes easily.	Moderate: slope.
PkD---------- Parke	Severe: slope.	Severe: slope.	Severe: slope.	Severe: erodes easily.	Severe: slope.
Pm---------- Patton	Severe: floods, ponding.	Severe: ponding.		Severe: ponding.	
PnB---------- Pekin	Severe: floods, percs slowly.	Severe: percs slowly.	Severe: percs slowly.	Severe: erodes easily.	Slight.
PpA---------- Pike	Slight----------	Slight----------	Slight----------	Severe: erodes easily.	Slight.
PpB2---------- Pike	Slight----------	Slight----------	Moderate: slope.	Severe: erodes easily.	Slight.
PrA---------- Princeton	Slight----------	Slight----------	Slight----------	Slight----------	Slight.
PrB---------- Princeton	Slight----------	Slight----------	Moderate: slope.	Slight----------	Slight.
PrC---------- Princeton	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight----------	Moderate: slope.
PrD, PrE---------- Princeton	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
Ps*. Pits					
Rd---------- Reesville	Severe: wetness.	Moderate: wetness, percs slowly.	Severe: wetness.	Severe: erodes easily.	Moderate: wetness.

See footnote at end of table.

TABLE 10.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
Re Rensselaer	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
Ro Ross	Severe: floods.	Slight	Moderate: floods.	Slight	Moderate: floods.
RuB Russell	Slight	Slight	Moderate: slope.	Severe: erodes easily.	Slight.
Sh Shoals	Severe: floods, wetness.	Moderate: floods, wetness.	Severe: wetness, floods.	Moderate: wetness, floods.	Severe: floods.
Sn Sloan	Severe: floods, wetness.	Severe: wetness.	Severe: wetness, floods.	Severe: wetness, erodes easily.	Severe: wetness, floods.
St Stonelick	Severe: floods.	Moderate: floods, small stones.	Severe: small stones, floods.	Moderate: floods.	Severe: floods.
Ta Taggart	Severe: wetness.	Moderate: wetness, percs slowly.	Severe: wetness.	Severe: erodes easily.	Moderate: wetness.
VoA Vigo	Severe: wetness, percs slowly.	Severe: wetness, percs slowly.	Severe: wetness, percs slowly.	Severe: wetness, erodes easily.	Severe: wetness.
Wa Wakeland	Severe: floods, wetness.	Moderate: floods, wetness.	Severe: wetness, floods.	Severe: erodes easily.	Severe: floods.
WcG Weikert	Severe: slope.	Severe: slope.	Severe: slope, depth to rock, small stones.	Severe: slope.	Severe: slope.
WfC Wellston	Moderate: slope.	Moderate: slope.	Severe: slope.	Severe: erodes easily.	Moderate: slope.
Wr Whitaker	Severe: wetness.	Moderate: wetness.	Severe: wetness.	Severe: erodes easily.	Moderate: wetness.
Wu Wilbur	Severe: floods.	Moderate: floods.	Severe: floods.	Severe: erodes easily.	Severe: floods.
XeB2 Xenia	Moderate: wetness, percs slowly.	Moderate: wetness, percs slowly.	Moderate: slope, wetness, percs slowly.	Severe: erodes easily.	Slight.
ZaB Zanesville	Moderate: percs slowly, wetness.	Moderate: wetness, percs slowly.	Moderate: slope, wetness, percs slowly.	Severe: erodes easily.	Slight.
ZaC Zanesville	Moderate: slope, percs slowly, wetness.	Moderate: slope, wetness, percs slowly.	Severe: slope.	Severe: erodes easily.	Moderate: slope.
Zp Zipp	Severe: floods, wetness, percs slowly.	Severe: wetness, percs slowly.	Severe: wetness, floods.	Severe: wetness.	Severe: wetness, floods.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 11.--WILDLIFE HABITAT

[See text for definitions of "good," "fair," "poor," and "very poor." Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Potential for habitat elements							Potential as habitat for--		
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife
AfA, AfB---------- Alford	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
AfC2---------- Alford	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
Ar---------- Armiesburg	Poor	Fair	Good	Good	Good	Poor	Poor	Fair	Good	Poor.
AvB---------- Ava	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
Ba---------- Banlic	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
Bd---------- Bartle	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
BeB---------- Bedford	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
BeC2---------- Bedford	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
BfG---------- Berks	Very poor.	Poor	Fair	Poor	Poor	Very poor.	Very poor.	Poor	Poor	Very poor.
BmC---------- Bloomfield	Poor	Fair	Fair	Poor	Poor	Very poor.	Very poor.	Poor	Poor	Very poor.
Bo---------- Bonnie	Poor	Fair	Fair	Fair	Poor	Good	Good	Fair	Fair	Good.
Br---------- Brookston	Fair	Poor	Poor	Poor	Poor	Good	Good	Poor	Poor	Good.
ChF---------- Chetwynd	Very poor.	Poor	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
CnC2, CnC3--------- Cincinnati	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
CnD2, CnD3--------- Cincinnati	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
CrA---------- Crosby	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
CsB2*: Crosby----------	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
Miami----------	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
EsC2---------- Elkinsville	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
Ev---------- Evansville	Fair	Fair	Fair	Fair	Fair	Good	Good	Fair	Fair	Good.

See footnote at end of table.

TABLE 11.--WILDLIFE HABITAT--Continued

Soil name and map symbol	Potential for habitat elements							Potential as habitat for--		
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife
FcA---- Fincastle	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
FoA, FoB2, FxC2*--- Fox	Good	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
Ge---- Genesee	Poor	Fair	Fair	Good	Good	Poor	Poor	Fair	Good	Poor.
GpC---- Gilpin	Fair	Good	Good	Fair	Fair	Very poor.	Very poor.	Good	Fair	Very poor.
GpD, GpE---- Gilpin	Poor	Fair	Good	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.
GrC---- Grayford	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
GrD2---- Grayford	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
Ha---- Haymond	Poor	Fair	Fair	Good	Good	Poor	Poor	Fair	Good	Poor.
HkF---- Hickory	Very poor.	Poor	Good	Good	Good	Very poor.	Very poor.	Poor	Good	Very poor.
IvA---- Iva	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
MbD2, MbE---- Markland	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
MeA, MeB---- Martinsville	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
MnB2---- Miami	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
MnC2---- Miami	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
MnD2, MnE---- Miami	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
MnF---- Miami	Very poor.	Poor	Good	Good	Good	Very poor.	Very poor.	Poor	Good	Very poor.
MoC3---- Miami	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
MoD3---- Miami	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
Mp---- Milford	Good	Fair	Fair	Fair	Fair	Good	Good	Fair	Fair	Good.
Mu---- Montgomery	Fair	Poor	Poor	Poor	Poor	Good	Good	Poor	Poor	Good.

See footnote at end of table.

TABLE 11.--WILDLIFE HABITAT--Continued

Soil name and map symbol	Potential for habitat elements							Potential as habitat for--		
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife
OcA, OcB2---------- Ockley	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
PkC2---------- Parke	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
PkD---------- Parke	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
Pm---------- Patton	Good	Good	Good	Fair	Fair	Good	Good	Good	Fair	Good.
PnB---------- Pekin	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
PpA, PpB2---------- Pike	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
PrA, PrB---------- Princeton	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
PrC---------- Princeton	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
PrD, PrE---------- Princeton	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
Ps. Pits										
Rd---------- Reesville	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
Re---------- Rensselaer	Fair	Poor	Poor	Poor	Poor	Good	Good	Poor	Poor	Good.
Ro---------- Ross	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
RuB---------- Russell	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
Sh---------- Shoals	Poor	Fair	Fair	Good	Good	Fair	Fair	Fair	Good	Fair.
Sn---------- Sloan	Fair	Fair	Good	Poor	Poor	Good	Good	Fair	Poor	Good.
St---------- Stonelick	Poor	Fair	Fair	Fair	Fair	Poor	Very poor.	Fair	Fair	Very poor.
Ta---------- Taggart	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
VoA---------- Vigo	Poor	Fair	Fair	Fair	Fair	Good	Good	Fair	Fair	Good.
Wa---------- Wakeland	Poor	Fair	Fair	Good	Good	Fair	Fair	Fair	Good	Fair.
WcG---------- Weikert	Very poor.	Poor	Poor	Very poor.	Very poor.	Very poor.	Very poor.	Poor	Very poor.	Very poor.
WfC---------- Wellston	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.

See footnote at end of table.

TABLE 11.--WILDLIFE HABITAT--Continued

Soil name and map symbol	Potential for habitat elements							Potential as habitat for--		
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife
Wr---------- Whitaker	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
Wu---------- Wilbur	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
XeB2---------- Xenia	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
ZaB---------- Zanesville	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
ZaC---------- Zanesville	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
Zp---------- Zipp	Fair	Poor	Poor	Poor	Poor	Good	Good	Poor	Poor	Good.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 12.--BUILDING SITE DEVELOPMENT

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
AfA--- Alford	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Severe: low strength, frost action.	Slight.
AfB--- Alford	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength, frost action.	Slight.
AfC2--- Alford	Moderate: slope.	Moderate: shrink-swell, slope.	Moderate: slope, shrink-swell.	Severe: slope.	Severe: low strength, frost action.	Moderate: slope.
Ar--- Armiesburg	Moderate: floods.	Severe: floods.	Severe: floods.	Severe: floods.	Severe: low strength, floods, frost action.	Severe: floods.
AvB--- Ava	Severe: wetness.	Moderate: wetness, shrink-swell.	Severe: wetness.	Moderate: wetness, shrink-swell.	Severe: low strength, frost action.	Slight.
Ba--- Banlic	Severe: wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Severe: frost action.	Moderate: wetness.
Bd--- Bartle	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: frost action.	Moderate: wetness.
BeB--- Bedford	Severe: wetness.	Moderate: wetness, shrink-swell.	Severe: wetness.	Moderate: wetness, shrink-swell, slope.	Severe: low strength, frost action.	Slight.
BeC2--- Bedford	Severe: wetness.	Moderate: wetness, shrink-swell, slope.	Severe: wetness.	Severe: slope.	Severe: low strength, frost action.	Moderate: slope.
BfG--- Berks	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
BmC--- Bloomfield	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: droughty, slope.
Bo--- Bonnie	Severe: wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Severe: low strength, wetness, floods.	Severe: wetness, floods.
Br--- Brookston	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: low strength, ponding, frost action.	Severe: ponding.
ChF--- Chetwynd	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
CnC2, CnC3--- Cincinnati	Moderate: dense layer, wetness, slope.	Moderate: slope.	Moderate: wetness, slope.	Severe: slope.	Severe: low strength, frost action.	Moderate: slope.
CnD2, CnD3--- Cincinnati	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope, frost action.	Severe: slope.

TABLE 12.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
CrA---- Crosby	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: low strength, frost action.	Moderate: wetness.
CsB2*: Crosby----	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: low strength, frost action.	Moderate: wetness.
Miami----	Slight----	Slight----	Slight----	Slight----	Moderate: frost action.	Slight.
EsC2---- Elkinsville	Moderate: slope.	Severe: floods.	Severe: floods.	Severe: floods.	Severe: low strength, frost action.	Moderate: slope.
Ev---- Evansville	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: low strength, ponding, frost action.	Severe: ponding.
FcA---- Fincastle	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: low strength, frost action.	Moderate: wetness.
FoA---- Fox	Severe: cutbanks cave.	Moderate: shrink-swell.	Slight----	Moderate: shrink-swell.	Moderate: frost action, shrink-swell.	Slight.
FoB2---- Fox	Severe: cutbanks cave.	Moderate: shrink-swell.	Slight----	Moderate: shrink-swell, slope.	Moderate: frost action, shrink-swell.	Slight.
FxC2*---- Fox	Severe: cutbanks cave.	Moderate: shrink-swell, slope.	Moderate: slope.	Severe: slope.	Moderate: slope, frost action, shrink-swell.	Moderate: slope.
Ge---- Genesee	Moderate: floods.	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.
GpC---- Gilpin	Moderate: slope, depth to rock.	Moderate: slope, frost action.	Moderate: slope, depth to rock.	Severe: slope.	Moderate: slope, frost action.	Moderate: slope, depth to rock.
GpD, GpE---- Gilpin	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
GrC---- Grayford	Moderate: slope.	Moderate: shrink-swell, slope.	Moderate: slope, shrink-swell.	Severe: slope.	Severe: low strength, frost action.	Moderate: slope.
GrD2---- Grayford	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope, frost action.	Severe: slope.
Ha---- Haymond	Moderate: floods.	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods, frost action.	Severe: floods.
HkF---- Hickory	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope.	Severe: slope.

See footnote at end of table.

TABLE 12.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
IvA---------- Iva	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: low strength, frost action.	Moderate: wetness.
MbD2, MbE--------- Markland	Severe: slope.	Severe: shrink-swell, slope.	Severe: slope, shrink-swell.	Severe: shrink-swell, slope.	Severe: low strength, slope, shrink-swell.	Severe: slope.
MeA---------- Martinsville	Severe: cutbanks cave.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: low strength, frost action.	Slight.
MeB---------- Martinsville	Severe: cutbanks cave.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Moderate: low strength, frost action.	Slight.
MnB2---------- Miami	Slight---------	Slight---------	Slight---------	Moderate: slope.	Moderate: frost action.	Slight.
MnC2---------- Miami	Moderate: slope.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope, frost action.	Moderate: slope.
MnD2, MnE, MnF---- Miami	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
MoC3---------- Miami	Moderate: slope.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope, frost action.	Moderate: slope.
MoD3---------- Miami	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Mp---------- Milford	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: low strength, ponding, frost action.	Severe: ponding.
Mu---------- Montgomery	Severe: ponding.	Severe: ponding, shrink-swell.	Severe: ponding, shrink-swell.	Severe: ponding, shrink-swell.	Severe: low strength, ponding, shrink-swell.	Severe: ponding.
OcA---------- Ockley	Severe: cutbanks cave.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Severe: low strength.	Slight.
OcB2---------- Ockley	Severe: cutbanks cave.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength.	Slight.
PkC2---------- Parke	Moderate: slope.	Moderate: shrink-swell, slope.	Moderate: slope.	Severe: slope.	Severe: low strength, frost action.	Moderate: slope.
PkD---------- Parke	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope, frost action.	Severe: slope.
Pm---------- Patton	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: low strength, ponding.	Severe: ponding.
PnB---------- Pekin	Severe: wetness.	Severe: floods.	Severe: floods, wetness.	Severe: floods.	Severe: frost action.	Slight.

TABLE 12.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
PpA---------- Pike	Slight---------	Slight---------	Slight---------	Slight---------	Severe: low strength, frost action.	Slight.
PpB2---------- Pike	Slight---------	Slight---------	Slight---------	Moderate: slope.	Severe: low strength, frost action.	Slight.
PrA---------- Princeton	Severe: cutbanks cave.	Slight---------	Slight---------	Slight---------	Moderate: frost action.	Slight.
PrB---------- Princeton	Severe: cutbanks cave.	Slight---------	Slight---------	Moderate: slope.	Moderate: frost action.	Slight.
PrC---------- Princeton	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope, frost action.	Moderate: slope.
PrD, PrE---------- Princeton	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Ps. Pits						
Rd---------- Reesville	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: low strength, frost action.	Moderate: wetness.
Re---------- Rensselaer	Severe: cutbanks cave, ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: low strength, ponding, frost action.	Severe: ponding.
Ro---------- Ross	Moderate: wetness, floods.	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.	Moderate: floods.
RuB---------- Russell	Slight---------	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength, frost action.	Slight.
Sh---------- Shoals	Severe: wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods, frost action.	Severe: floods.
Sn---------- Sloan	Severe: wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Severe: low strength, wetness, floods.	Severe: wetness, floods.
St---------- Stonelick	Severe: cutbanks cave.	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.
Ta---------- Taggart	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: low strength, frost action.	Moderate: wetness.
VoA---------- Vigo	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: low strength, wetness, frost action.	Severe: wetness.
Wa---------- Wakeland	Severe: wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods, frost action.	Severe: floods.
WcG---------- Weikert	Severe: slope, depth to rock.	Severe: slope.	Severe: slope, depth to rock.	Severe: slope.	Severe: slope.	Severe: slope.

TABLE 12.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
WfC---------- Wellston	Moderate: depth to rock, slope.	Moderate: slope.	Moderate: depth to rock, slope.	Severe: slope.	Severe: frost action.	Moderate: slope.
Wr---------- Whitaker	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: low strength, frost action.	Moderate: wetness.
Wu---------- Wilbur	Moderate: wetness, floods.	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods, frost action.	Severe: floods.
XeB2---------- Xenia	Severe: wetness.	Moderate: wetness, shrink-swell.	Severe: wetness.	Moderate: wetness, shrink-swell, slope.	Severe: low strength, frost action.	Slight.
ZaB---------- Zanesville	Moderate: depth to rock, wetness.	Moderate: wetness.	Severe: wetness.	Moderate: slope, wetness.	Severe: low strength.	Slight.
ZaC---------- Zanesville	Moderate: slope, wetness, depth to rock.	Moderate: slope, wetness.	Severe: wetness.	Severe: slope.	Severe: low strength.	Moderate: slope.
Zp---------- Zipp	Severe: ponding.	Severe: shrink-swell, ponding.	Severe: shrink-swell, ponding.	Severe: shrink-swell, ponding.	Severe: low strength, ponding.	Severe: ponding.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 13.--SANITARY FACILITIES

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," "good," "fair," and other terms. Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
AfA---- Alford	Slight----	Moderate: seepage.	Moderate: too clayey.	Slight----	Fair: too clayey.
AfB---- Alford	Slight----	Moderate: seepage, slope.	Moderate: too clayey.	Slight----	Fair: too clayey.
AfC2---- Alford	Moderate: slope.	Severe: slope.	Moderate: slope, too clayey.	Moderate: slope.	Fair: too clayey, slope.
Ar---- Armiesburg	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.	Poor: hard to pack.
AvB---- Ava	Severe: wetness, percs slowly.	Severe: wetness.	Moderate: wetness, too clayey.	Moderate: wetness.	Fair: too clayey, wetness.
Ba---- Banlic	Severe: percs slowly, wetness.	Slight----	Severe: wetness.	Severe: wetness.	Poor: wetness.
Bd---- Bartle	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Poor: wetness.
BeB---- Bedford	Severe: wetness, percs slowly.	Severe: wetness.	Severe: too clayey.	Moderate: wetness.	Poor: too clayey, hard to pack.
BeC2---- Bedford	Severe: wetness, percs slowly.	Severe: slope, wetness.	Severe: too clayey.	Moderate: wetness, slope.	Poor: too clayey, hard to pack.
BfG---- Berks	Severe: slope, depth to rock.	Severe: slope, seepage, depth to rock.	Severe: slope, depth to rock, seepage.	Severe: slope, seepage.	Poor: slope, small stones.
BmC---- Bloomfield	Severe: poor filter.	Severe: seepage, slope.	Severe: seepage.	Severe: seepage.	Poor: seepage.
Bo---- Bonnie	Severe: floods, wetness, percs slowly.	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Poor: wetness.
Br---- Brookston	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Poor: ponding, hard to pack.
ChF---- Chetwynd	Severe: slope.	Severe: seepage, slope.	Severe: seepage, slope.	Severe: slope.	Poor: slope.
CnC2, CnC3---- Cincinnati	Severe: percs slowly.	Severe: slope.	Moderate: slope, too clayey.	Moderate: slope.	Fair: too clayey, slope.
CnD2, CnD3---- Cincinnati	Severe: percs slowly, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.

TABLE 13.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
CrA---------- Crosby	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Poor: wetness.
CsB2*: Crosby----------	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Poor: wetness.
Miami----------	Severe: percs slowly.	Moderate: seepage, slope.	Moderate: too clayey.	Slight----------	Fair: too clayey.
EsC2---------- Elkinsville	Moderate: slope, flooding.	Severe: slope.	Moderate: floods, slope, too clayey.	Moderate: floods, slope.	Fair: too clayey, slope.
Ev---------- Evansville	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Poor: hard to pack, ponding.
FcA---------- Fincastle	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Poor: hard to pack, wetness.
FoA, FoB2---------- Fox	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy, small stones.
FxC2*---------- Fox	Severe: poor filter.	Severe: seepage, slope.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy, small stones.
Ge---------- Genesee	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.	Good.
GpC---------- Gilpin	Severe: depth to rock.	Severe: depth to rock, slope.	Severe: depth to rock.	Moderate: slope.	Fair: thin layer.
GpD, GpE---------- Gilpin	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock.	Severe: slope.	Poor: slope.
GrC---------- Grayford	Moderate: slope, percs slowly.	Severe: slope.	Moderate: slope, too clayey.	Moderate: slope.	Fair: too clayey, slope.
GrD2---------- Grayford	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
Ha---------- Haymond	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.	Good.
HkF---------- Hickory	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
IvA---------- Iva	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Poor: wetness.

See footnote at end of table.

TABLE 13.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
MbD2, MbE---- Markland	Severe: wetness, percs slowly, slope.	Severe: slope, wetness.	Severe: slope, too clayey.	Severe: slope.	Poor: too clayey, hard to pack, slope.
MeA---- Martinsville	Slight----	Moderate: seepage.	Moderate: too clayey.	Slight----	Fair: too clayey, thin layer.
MeB---- Martinsville	Slight----	Moderate: seepage, slope.	Moderate: too clayey.	Slight----	Fair: too clayey, thin layer.
MnB2---- Miami	Severe: percs slowly.	Moderate: seepage, slope.	Moderate: too clayey.	Slight----	Fair: too clayey.
MnC2---- Miami	Severe: percs slowly.	Severe: slope.	Moderate: slope, too clayey.	Moderate: slope.	Fair: too clayey, slope.
MnD2, MnE, MnF---- Miami	Severe: percs slowly, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
MoC3---- Miami	Severe: percs slowly.	Severe: slope.	Moderate: slope, too clayey.	Moderate: slope.	Fair: too clayey, slope.
MoD3---- Miami	Severe: percs slowly, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
Mp---- Milford	Severe: ponding, percs slowly.	Severe: ponding.	Severe: ponding, too clayey.	Severe: ponding.	Poor: too clayey, hard to pack, ponding.
Mu---- Montgomery	Severe: ponding, percs slowly.	Severe: ponding.	Severe: ponding, too clayey.	Severe: ponding.	Poor: too clayey, hard to pack, ponding.
OcA, OcB2---- Ockley	Slight----	Severe: seepage.	Severe: seepage.	Slight----	Poor: small stones.
PkC2---- Parke	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: slope.	Fair: slope.
PkD---- Parke	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
Pm---- Patton	Severe: ponding, percs slowly.	Severe: floods, ponding.	Severe: ponding.	Severe: ponding.	Poor: ponding.
PnB---- Pekin	Severe: wetness, percs slowly.	Severe: floods, wetness.	Severe: wetness.	Severe: wetness.	Fair: too clayey, wetness.
PpA---- Pike	Slight----	Moderate: seepage.	Severe: seepage.	Slight----	Fair: too clayey.
PpB2---- Pike	Slight----	Moderate: seepage, slope.	Severe: seepage.	Slight----	Fair: too clayey.

TABLE 13.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
PrA, PrB---------- Princeton	Slight----------	Severe: seepage.	Severe: seepage.	Slight----------	Good.
PrC---------- Princeton	Moderate: slope.	Severe: seepage, slope.	Severe: seepage.	Moderate: slope.	Fair: slope.
PrD, PrE---------- Princeton	Severe: slope.	Severe: seepage, slope.	Severe: seepage, slope.	Severe: slope.	Poor: slope.
Ps. Pits					
Rd---------- Reesville	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Poor: wetness.
Re---------- Rensselaer	Severe: ponding, percs slowly.	Severe: ponding.	Severe: ponding, too sandy.	Severe: ponding.	Poor: too sandy, ponding.
Ro---------- Ross	Severe: floods.	Severe: seepage, floods.	Severe: floods, seepage, wetness.	Severe: floods, seepage.	Good.
RuB---------- Russell	Moderate: percs slowly.	Moderate: seepage, slope.	Moderate: too clayey.	Slight----------	Fair: too clayey.
Sh---------- Shoals	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Poor: wetness.
Sn---------- Sloan	Severe: floods, wetness, percs slowly.	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Poor: wetness.
St---------- Stonelick	Severe: floods.	Severe: seepage, floods.	Severe: floods, seepage.	Severe: floods, seepage.	Poor: seepage.
Ta---------- Taggart	Severe: wetness, percs slowly.	Severe: wetness.	Severe: seepage, wetness.	Severe: wetness.	Poor: hard to pack, wetness.
VoA---------- Vigo	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Poor: hard to pack, wetness.
Wa---------- Wakeland	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Poor: wetness.
WcG---------- Weikert	Severe: slope, depth to rock.	Severe: slope, depth to rock, seepage.	Severe: slope, depth to rock, seepage.	Severe: slope, seepage.	Poor: slope, thin layer.
WfC---------- Wellston	Moderate: depth to rock, percs slowly, slope.	Severe: slope.	Severe: depth to rock.	Moderate: depth to rock, slope.	Fair: area reclaim, small stones, slope.

TABLE 13.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
Wr Whitaker	Severe: wetness.	Severe: seepage, wetness.	Severe: seepage, wetness.	Severe: wetness.	Poor: wetness.
Wu Wilbur	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Fair: wetness.
XeB2 Xenia	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Fair: too clayey, wetness.
ZaB Zanesville	Severe: percs slowly, wetness.	Severe: wetness.	Severe: depth to rock.	Moderate: depth to rock, wetness.	Fair: too clayey, area reclaim.
ZaC Zanesville	Severe: percs slowly, wetness.	Severe: slope, wetness.	Severe: depth to rock.	Moderate: depth to rock, slope, wetness.	Fair: slope, too clayey, area reclaim.
Zp Zipp	Severe: ponding, percs slowly.	Severe: ponding.	Severe: ponding, too clayey.	Severe: ponding.	Poor: too clayey, hard to pack, ponding.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 14.--CONSTRUCTION MATERIALS

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "good," "fair," "poor," "probable," and "improbable." Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
AfA, AfB---- Alford	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
AfC2---- Alford	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: slope.
Ar---- Armiesburg	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
AvB---- Ava	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
Ba---- Banlic	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
Bd---- Bartle	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
BeB---- Bedford	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: area reclaim.
BeC2---- Bedford	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: area reclaim, slope.
BfG---- Berks	Poor: slope, thin layer.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope, small stones.
BmC---- Bloomfield	Good----	Probable----	Improbable: too sandy.	Fair: too sandy, slope.
Bo---- Bonnie	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
Br---- Brookston	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
ChF---- Chetwynd	Poor: slope.	Probable----	Probable----	Poor: slope.
CnC2, CnC3---- Cincinnati	Fair: shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Fair: area reclaim, small stones, slope.
CnD2, CnD3---- Cincinnati	Fair: slope, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
CrA---- Crosby	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Fair: area reclaim, small stones.
CsB2*: Crosby----	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Fair: area reclaim, small stones.
Miami----	Good----	Improbable: excess fines.	Improbable: excess fines.	Fair: area reclaim.

See footnote at end of table.

TABLE 14.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
EsC2---- Elkinsville	Good----	Improbable: excess fines.	Improbable: excess fines.	Fair: slope.
Ev---- Evansville	Poor: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
FcA---- Fincastle	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Good.
FoA, FoB2, FxC2*---- Fox	Good----	Probable----	Probable----	Poor: small stones, area reclaim.
Ge---- Genesee	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
GpC---- Gilpin	Poor: thin layer.	Improbable: excess fines.	Improbable: excess fines.	Fair: slope, thin layer, small stones.
GpD, GpE---- Gilpin	Poor: thin layer.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
GrC---- Grayford	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones, slope.
GrD2---- Grayford	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
Ha---- Haymond	Good----	Improbable: excess fines.	Improbable: excess fines.	Good.
HkF---- Hickory	Poor: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
IvA---- Iva	Fair: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Good.
MbD2, MbE---- Markland	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer, slope.
MeA, MeB---- Martinsville	Good----	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
MnB2---- Miami	Good----	Improbable: excess fines.	Improbable: excess fines.	Fair: area reclaim.
MnC2---- Miami	Good----	Improbable: excess fines.	Improbable: excess fines.	Fair: area reclaim, slope.
MnD2, MnE---- Miami	Fair: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.

See footnote at end of table.

TABLE 14.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
MnF---- Miami	Poor: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
MoC3---- Miami	Good----	Improbable: excess fines.	Improbable: excess fines.	Fair: area reclaim, slope.
MoD3---- Miami	Fair: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
Mp---- Milford	Poor: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
Mu---- Montgomery	Poor: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
OcA, OcB2---- Ockley	Good----	Probable----	Probable----	Poor: small stones, area reclaim.
PkC2---- Parke	Good----	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones, slope.
PkD---- Parke	Fair: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
Pm---- Patton	Poor: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
PnB---- Pekin	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Good.
PpA, PpB2---- Pike	Good----	Improbable: excess fines.	Improbable: excess fines.	Good.
PrA, PrB---- Princeton	Good----	Improbable: excess fines.	Improbable: excess fines.	Good.
PrC---- Princeton	Good----	Improbable: excess fines.	Improbable: excess fines.	Fair: slope.
PrD, PrE---- Princeton	Fair: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
Ps. Pits				
Rd---- Reesville	Fair: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
Re---- Rensselaer	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
Ro---- Ross	Good----	Improbable: excess fines.	Improbable: excess fines.	Good.
RuB---- Russell	Good----	Improbable: excess fines.	Improbable: excess fines.	Good.
Sh---- Shoals	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Good.

TABLE 14.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
Sn---------- Sloan	Poor: wetness, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
St---------- Stonelick	Good----------	Probable----------	Improbable: too sandy.	Poor: small stones.
Ta---------- Taggart	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Good.
VoA---------- Vigo	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
Wa---------- Wakeland	Fair: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Good.
WcG---------- Weikert	Poor: slope, depth to rock.	Improbable: small stones.	Improbable: thin layer.	Poor: slope, small stones, thin layer.
WfC---------- Wellston	Fair: area reclaim, thin layer.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
Wr---------- Whitaker	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Good.
Wu---------- Wilbur	Fair: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
XeB2---------- Xenia	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Good.
ZaB, ZaC---------- Zanesville	Fair: area reclaim, thin layer, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim.
Zp---------- Zipp	Poor: low strength, wetness, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 15.--WATER MANAGEMENT

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not evaluated]

Soil name and map symbol	Limitations for--			Features affecting--		
	Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Drainage	Terraces and diversions	Grassed waterways
AfA---- Alford	Moderate: seepage.	Slight----	Severe: no water.	Deep to water	Erodes easily	Erodes easily.
AfB---- Alford	Moderate: seepage, slope.	Slight----	Severe: no water.	Deep to water	Erodes easily	Erodes easily.
AfC2---- Alford	Severe: slope.	Slight----	Severe: no water.	Deep to water	Slope, erodes easily.	Slope, erodes easily.
Ar---- Armiesburg	Moderate: seepage.	Moderate: hard to pack.	Severe: no water.	Deep to water	Favorable----	Favorable.
AvB---- Ava	Moderate: slope.	Severe: piping.	Severe: no water.	Percs slowly, frost action, slope.	Erodes easily, wetness.	Erodes easily, rooting depth.
Ba---- Banlic	Slight----	Severe: piping.	Severe: no water.	Percs slowly, frost action.	Wetness, percs slowly, erodes easily.	Wetness, percs slowly, erodes easily.
Bd---- Bartle	Moderate: seepage.	Moderate: piping, wetness.	Severe: no water.	Percs slowly, frost action.	Erodes easily, wetness, rooting depth.	Wetness, erodes easily, rooting depth.
BeB---- Bedford	Moderate: seepage, slope.	Moderate: hard to pack, wetness.	Severe: no water.	Percs slowly, frost action, slope.	Erodes easily, wetness.	Erodes easily, rooting depth.
BeC2---- Bedford	Severe: slope.	Moderate: hard to pack, wetness.	Severe: no water.	Percs slowly, frost action, slope.	Slope, erodes easily, wetness.	Slope, erodes easily, rooting depth.
BfG---- Berks	Severe: seepage, slope.	Severe: thin layer.	Severe: no water.	Not needed----	Depth to rock, slope, small stones.	Depth to rock, droughty, slope.
BmC---- Bloomfield	Severe: seepage, slope.	Severe: seepage, piping.	Severe: no water.	Deep to water	Slope, soil blowing.	Slope, droughty, rooting depth.
Bo---- Bonnie	Moderate: seepage.	Severe: wetness.	Severe: slow refill.	Floods, frost action.	Erodes easily, wetness.	Wetness, erodes easily.
Br---- Brookston	Moderate: seepage.	Severe: ponding.	Severe: slow refill.	Ponding, frost action.	Ponding----	Wetness.
ChF---- Chetwynd	Severe: slope.	Moderate: thin layer, piping.	Severe: no water.	Deep to water	Slope----	Slope.
CnC2, CnC3, CnD2, CnD3---- Cincinnati	Severe: slope.	Severe: thin layer.	Severe: no water.	Deep to water	Slope, erodes easily, rooting depth.	Slope, erodes easily, rooting depth.
CrA---- Crosby	Slight----	Severe: piping, wetness.	Severe: slow refill.	Percs slowly, frost action.	Erodes easily, wetness, percs slowly.	Wetness, erodes easily, rooting depth.
CsB2*: Crosby----	Moderate: slope.	Severe: piping, wetness.	Severe: slow refill.	Percs slowly, frost action, slope.	Erodes easily, wetness, percs slowly.	Wetness, erodes easily, rooting depth.

See footnote at end of table.

TABLE 15.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for--			Features affecting--		
	Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Drainage	Terraces and diversions	Grassed waterways
CsB2*: Miami	Moderate: seepage, slope.	Severe: piping.	Severe: no water.	Deep to water	Erodes easily	Erodes easily, rooting depth.
EsC2--- Elkinsville	Severe: slope.	Moderate: thin layer, piping.	Severe: no water.	Deep to water	Slope, erodes easily.	Slope, erodes easily.
Ev--- Evansville	Moderate: seepage.	Severe: ponding.	Moderate: slow refill.	Ponding, frost action.	Erodes easily, ponding.	Wetness, erodes easily.
FcA--- Fincastle	Moderate: seepage.	Severe: wetness.	Severe: slow refill.	Frost action---	Erodes easily, wetness.	Wetness, erodes easily.
FoA, FoB2--- Fox	Severe: seepage.	Severe: seepage, piping.	Severe: no water.	Deep to water	Too sandy---	Rooting depth.
FxC2*--- Fox	Severe: seepage, slope.	Severe: seepage, piping.	Severe: no water.	Deep to water	Slope, too sandy.	Slope, rooting depth.
Ge--- Genesee	Moderate: seepage.	Moderate: piping.	Severe: no water.	Deep to water	Erodes easily	Erodes easily.
GpC, GpD, GpE--- Gilpin	Severe: slope.	Severe: piping.	Severe: no water.	Not needed---	Slope, depth to rock.	Slope, depth to rock.
GrC, GrD2--- Grayford	Severe: slope.	Moderate: thin layer.	Severe: no water.	Deep to water	Slope, erodes easily.	Slope, erodes easily.
Ha--- Haymond	Moderate: seepage.	Severe: piping.	Severe: no water.	Deep to water	Erodes easily	Erodes easily.
HkF--- Hickory	Severe: slope.	Severe: thin layer.	Severe: no water.	Deep to water	Slope, erodes easily.	Slope, erodes easily, rooting depth.
IvA--- Iva	Moderate: seepage.	Severe: thin layer, wetness.	Severe: slow refill.	Percs slowly, frost action.	Erodes easily, wetness, percs slowly.	Wetness, erodes easily, percs slowly.
MbD2, MbE--- Markland	Severe: slope.	Moderate: hard to pack.	Severe: no water.	Deep to water	Slope, erodes easily, percs slowly.	Slope, erodes easily, percs slowly.
MeA--- Martinsville	Moderate: seepage.	Severe: thin layer.	Severe: no water.	Deep to water	Erodes easily	Erodes easily.
MeB--- Martinsville	Moderate: seepage, slope.	Severe: thin layer.	Severe: no water.	Deep to water	Erodes easily	Erodes easily.
MnB2--- Miami	Moderate: seepage, slope.	Severe: piping.	Severe: no water.	Deep to water	Erodes easily	Erodes easily, rooting depth.
MnC2, MnD2, MnE, MnF, MoC3, MoD3--- Miami	Severe: slope.	Severe: piping.	Severe: no water.	Deep to water	Slope, erodes easily.	Slope, erodes easily, rooting depth.

See footnote at end of table.

TABLE 15.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for--			Features affecting--		
	Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Drainage	Terraces and diversions	Grassed waterways
Mp---------- Milford	Slight----------	Severe: ponding.	Severe: slow refill.	Ponding, percs slowly, frost action.	Erodes easily, ponding, percs slowly.	Wetness, erodes easily, percs slowly.
Mu---------- Montgomery	Slight----------	Severe: hard to pack, ponding.	Severe: slow refill.	Ponding, percs slowly.	Erodes easily, ponding, percs slowly.	Wetness, erodes easily, percs slowly.
OcA---------- Ockley	Moderate: seepage.	Moderate: thin layer.	Severe: no water.	Deep to water	Erodes easily	Erodes easily.
OcB2---------- Ockley	Moderate: seepage, slope.	Moderate: thin layer.	Severe: no water.	Deep to water	Erodes easily	Erodes easily.
PkC2, PkD---------- Parke	Severe: slope.	Slight----------	Severe: no water.	Deep to water	Slope, erodes easily.	Slope, erodes easily.
Pm---------- Patton	Moderate: seepage.	Severe: ponding.	Severe: slow refill.	Ponding, frost action.	Ponding--------	Wetness.
PnB---------- Pekin	Moderate: seepage, slope.	Severe: piping.	Severe: slow refill.	Percs slowly, frost action, slope.	Erodes easily, wetness.	Erodes easily, rooting depth.
PpA---------- Pike	Moderate: seepage.	Moderate: piping.	Severe: no water.	Deep to water	Erodes easily	Erodes easily.
PpB2---------- Pike	Moderate: seepage, slope.	Moderate: piping.	Severe: no water.	Deep to water	Erodes easily	Erodes easily.
PrA---------- Princeton	Moderate: seepage.	Moderate: thin layer, piping.	Severe: no water.	Deep to water	Soil blowing---	Favorable.
PrB---------- Princeton	Moderate: seepage, slope.	Moderate: thin layer, piping.	Severe: no water.	Deep to water	Soil blowing---	Favorable.
PrC, PrD, PrE----- Princeton	Severe: slope.	Moderate: thin layer, piping.	Severe: no water.	Deep to water	Slope, soil blowing.	Slope.
Ps. Pits						
Rd---------- Reesville	Moderate: seepage.	Severe: piping, wetness.	Severe: slow refill.	Frost action---	Erodes easily, wetness.	Wetness, erodes easily.
Re---------- Rensselaer	Moderate: seepage.	Severe: piping, ponding.	Severe: slow refill, cutbanks cave.	Ponding, percs slowly, frost action.	Ponding, too sandy.	Wetness, percs slowly.
Ro---------- Ross	Severe: seepage.	Severe: piping.	Moderate: deep to water, slow refill.	Deep to water	Favorable------	Favorable.
RuB---------- Russell	Moderate: seepage, slope.	Moderate: thin layer.	Severe: no water.	Deep to water	Erodes easily	Erodes easily.
Sh---------- Shoals	Moderate: seepage.	Severe: wetness, piping.	Moderate: slow refill.	Floods, frost action.	Erodes easily, wetness.	Wetness, erodes easily.
Sn---------- Sloan	Moderate: seepage.	Severe: piping, wetness.	Severe: slow refill.	Floods, frost action.	Erodes easily, wetness.	Wetness, erodes easily.

TABLE 15.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for--			Features affecting--		
	Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Drainage	Terraces and diversions	Grassed waterways
St---------- Stonelick	Severe: seepage.	Severe: seepage, piping.	Severe: no water.	Deep to water	Too sandy, soil blowing.	Droughty.
Ta---------- Taggart	Moderate: seepage.	Severe: wetness.	Severe: slow refill, cutbanks cave.	Percs slowly, frost action.	Erodes easily, wetness, percs slowly.	Wetness, erodes easily, percs slowly.
VoA---------- Vigo	Slight----------	Severe: wetness.	Severe: slow refill.	Percs slowly, frost action.	Erodes easily, wetness, percs slowly.	Wetness, erodes easily, percs slowly.
Wa---------- Wakeland	Moderate: seepage.	Severe: piping, wetness.	Moderate: slow refill.	Floods, frost action.	Erodes easily, wetness.	Wetness, erodes easily.
WcG---------- Weikert	Severe: depth to rock, slope.	Severe: seepage.	Severe: no water.	Not needed-----	Depth to rock, rooting depth.	Depth to rock, rooting depth, droughty.
WfC---------- Wellston	Severe: slope.	Severe: piping.	Severe: no water.	Deep to water	Slope, erodes easily.	Slope, erodes easily.
Wr---------- Whitaker	Moderate: seepage.	Severe: wetness.	Moderate: slow refill, cutbanks cave.	Frost action---	Erodes easily, wetness.	Wetness, erodes easily.
Wu---------- Wilbur	Moderate: seepage.	Severe: piping.	Moderate: deep to water, slow refill.	Deep to water	Erodes easily	Erodes easily.
XeB2---------- Xenia	Moderate: seepage, slope.	Moderate: thin layer, wetness.	Severe: slow refill.	Frost action, slope.	Erodes easily, wetness.	Erodes easily.
ZaB---------- Zanesville	Moderate: seepage, depth to rock, slope.	Severe: piping.	Severe: no water.	Percs slowly, slope.	Erodes easily, wetness.	Erodes easily, rooting depth.
ZaC---------- Zanesville	Severe: slope.	Severe: piping.	Severe: no water.	Percs slowly, slope.	Slope, erodes easily, wetness.	Slope, erodes easily, wetness.
Zp---------- Zipp	Slight----------	Severe: wetness.	Severe: slow refill.	Percs slowly, floods.	Wetness, percs slowly.	Wetness, percs slowly.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 16.--ENGINEERING INDEX PROPERTIES

[The symbol < means less than; > means more than. Absence of an entry indicates that data were not estimated]

Soil name and map symbol	Depth	USDA texture	Classification		Fragments > 3 inches	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
AfA, AfB, AfC2--- Alford	0-8	Silt loam---------	CL, CL-ML	A-4, A-6	0	100	100	90-100	70-100	25-40	5-15
	8-40	Silty clay loam, silt loam.	CL	A-6, A-7	0	100	100	90-100	80-100	30-50	15-30
	40-70	Silt loam, silt	CL, CL-ML	A-4, A-6	0	100	100	90-100	70-100	25-40	5-15
Ar----------	0-15	Silt loam, silty clay loam.	CL, CH	A-6, A-7	0	100	100	95-100	85-95	35-55	20-35
Armiesburg	15-60	Silty clay loam, silt loam.	CL, CH	A-6, A-7	0	100	100	95-100	85-95	35-55	20-35
AvB----------	0-14	Silt loam---------	CL	A-6, A-4	0	100	95-100	95-100	85-100	25-40	9-17
Ava	14-29	Silty clay loam, silt loam.	CL	A-6, A-7	0	100	100	95-100	95-100	30-45	15-25
	29-62	Silty clay loam, silt loam.	CL	A-6, A-7	0	100	100	95-100	90-100	30-50	15-30
	62-80	Clay loam, silt loam, loam.	CL, CL-ML	A-4, A-6, A-7	0	100	95-100	90-100	70-90	20-45	5-20
Ba----------	0-7	Silt loam---------	ML, CL, CL-ML	A-4	0	100	95-100	90-100	80-95	21-29	3-9
Banlic	7-22	Silt loam---------	ML, CL-ML, CL	A-4	0	100	95-100	90-100	80-95	22-32	3-10
	22-70	Silt loam, silt	ML, CL-ML, CL	A-4	0	100	95-100	90-100	80-95	22-32	3-10
Bd----------	0-7	Silt loam---------	CL, CL-ML	A-4, A-6	0	100	100	85-100	65-90	20-35	5-15
Bartle	7-26	Silt loam, silty clay loam.	CL, CL-ML	A-4, A-6	0	100	100	90-100	70-90	25-35	5-15
	26-57	Silt loam, silty clay loam.	CL	A-6, A-7	0	100	100	90-100	70-95	30-45	10-25
	57-60	Silty clay loam, silt loam.	CL	A-6, A-7	0	100	100	90-100	70-95	30-45	10-25
BeB, BeC2---------	0-7	Silt loam---------	CL, ML	A-6, A-4	0	100	100	95-100	85-95	30-40	5-15
Bedford	7-27	Silty clay loam, silt loam.	CL	A-6, A-7	0	100	95-100	95-100	85-95	25-45	15-25
	27-49	Silty clay loam	CL	A-6, A-7	0	100	95-100	95-100	85-95	25-45	15-25
	49-80	Silty clay, clay, silty clay loam.	CL, CH	A-7	0-5	90-100	75-95	70-95	65-90	45-55	20-30
BfG----------	0-6	Channery silt loam.	GM, ML, GC, SC	A-2, A-4	0-30	50-80	45-70	40-60	30-55	25-36	5-10
Berks	6-24	Channery loam, very channery loam, channery silt loam.	GM, SM, GC, SC	A-1, A-2, A-4	0-30	40-80	35-70	25-60	20-45	25-36	5-10
	24-30	Channery loam, very channery loam, channery silt loam.	GM, SM, GC, SC	A-1, A-2	0-40	35-65	25-55	20-40	15-35	24-38	2-10
	30	Weathered bedrock	---	---	---	---	---	---	---	---	---
BmC----------	0-32	Loamy fine sand, loamy sand.	SM, SP, SP-SM	A-2-4, A-3, A-4	0	100	100	70-90	4-40	---	NP
Bloomfield	32-61	Fine sand, fine sandy loam, sandy loam, loamy sand.	SM, SP, SP-SM	A-2-4, A-4, A-3	0	100	100	65-80	4-40	<20	NP-3
	61-70	Fine sand---------	SP, SM, SP-SM	A-2-4, A-3	0	100	100	65-80	4-30	---	NP
Bo----------	0-8	Silt loam---------	CL	A-4, A-6	0	100	100	95-100	90-100	27-34	8-12
Bonnie	8-60	Silt loam, silty clay loam.	CL	A-4, A-6	0	100	100	95-100	90-100	27-34	8-12

TABLE 16.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
Br	0-17	Clay loam	CL	A-6, A-7	0	100	98-100	95-100	75-95	36-50	15-25
Brookston	17-49	Clay loam, silty clay loam.	CL, CH	A-6, A-7	0	98-100	85-100	75-95	60-85	36-52	18-30
	49-60	Loam, sandy loam, clay loam.	CL	A-4, A-6	0-3	90-100	85-95	78-90	55-70	22-30	7-15
ChF	0-9	Loam	CL-ML, CL	A-4, A-6	0	90-100	85-100	75-95	60-95	22-33	4-12
Chetwynd	9-44	Clay loam, sandy clay loam, loam.	SC, CL	A-4, A-6	0	90-100	85-100	70-95	40-75	20-35	8-18
	44-57	Sandy clay loam, sandy loam, gravelly sandy clay loam.	SM-SC, SC, CL-ML, CL	A-2-4, A-2-6, A-4, A-6	0	70-95	65-95	60-90	30-65	20-32	5-15
	57-72	Stratified sand to sandy loam.	SW-SM, SM, SP-SM	A-2, A-1, A-3, A-4	0	70-95	65-95	35-65	6-38	---	NP
CnC2, CnC3, CnD2, CnD3	0-16	Silt loam	ML, CL	A-4, A-6	0	100	100	90-100	80-100	25-40	3-16
Cincinnati	16-23	Silty clay loam, loam, silt loam.	CL	A-6, A-4	0	95-100	90-100	90-100	70-100	26-40	8-15
	23-47	Clay loam, loam, silty clay loam.	CL, CL-ML	A-6, A-4	0	95-100	85-100	75-95	65-85	20-35	6-14
	47-80	Clay loam, loam	CL, ML, CL-ML	A-6, A-4	0	95-100	85-100	75-95	65-85	20-35	3-14
CrA	0-8	Silt loam	CL, CL-ML	A-4, A-6	0	100	95-100	80-100	50-90	22-34	6-15
Crosby	8-36	Clay loam, silty clay loam.	CL, CH	A-6, A-7	0-3	92-99	89-97	78-93	64-76	37-55	17-31
	36-60	Loam, clay loam, sandy loam.	CL, ML, CL-ML	A-4, A-6	0-3	88-94	83-89	74-87	50-64	17-30	2-14
CsB2*:											
Crosby	0-8	Silt loam	CL, CL-ML	A-4, A-6	0	100	95-100	80-100	50-90	22-34	6-15
	8-28	Clay loam, silty clay loam.	CL, CH	A-6, A-7	0-3	92-99	89-97	78-93	64-76	37-55	17-31
	28-60	Loam, clay loam, sandy loam.	CL, ML, CL-ML	A-4, A-6	0-3	88-94	83-89	74-87	50-64	17-30	2-14
Miami	0-7	Silt loam	CL, CL-ML	A-4, A-6	0	100	95-100	80-100	50-90	22-34	6-15
	7-37	Clay loam, silty clay loam, sandy clay loam.	CL	A-6, A-7	0	92-99	89-97	78-95	64-95	35-50	17-31
	37-60	Loam, clay loam, sandy loam.	CL, CL-ML, ML	A-4, A-6	0-3	88-94	83-89	74-87	50-64	17-30	2-14
EsC2	0-5	Silt loam	CL, CL-ML	A-4, A-6	0	100	100	90-100	70-90	25-40	5-15
Elkinsville	5-64	Silty clay loam, silt loam.	CL	A-6, A-4	0	100	100	85-100	65-90	30-40	8-18
	64-80	Silty clay loam, loam, sandy clay loam.	CL	A-4, A-6	0	100	100	80-100	50-90	30-40	8-18
Ev	0-8	Silty clay loam	CL, CH	A-6, A-7	0	100	100	95-100	85-98	35-55	20-35
Evansville	8-50	Silty clay loam, silt loam.	CL, CH	A-6, A-7	0	100	100	95-100	85-98	35-55	20-35
	50-60	Stratified silt loam to silty clay loam.	CL	A-6, A-7	0	100	100	90-100	70-98	30-45	10-25
FcA	0-10	Silt loam	CL, ML	A-4, A-6	0	100	95-100	90-100	75-93	27-36	4-12
Fincastle	10-35	Silty clay loam, silt loam.	CL, CH	A-6, A-7	0	100	100	95-100	85-95	38-54	20-32
	35-52	Clay loam, loam, silty clay loam.	CH, CL	A-7	0	95-100	90-98	85-95	75-85	45-58	30-38
	52-60	Loam, clay loam	CL, ML, CL-ML	A-4, A-6	0-3	88-96	82-90	70-86	50-66	20-35	3-12

See footnote at end of table.

TABLE 16.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
FoA, FoB2---------- Fox	0-11	Loam----------	ML, CL, CL-ML	A-4	0	95-100	85-100	75-95	55-90	20-30	3-10
	11-35	Clay loam, loam, sandy clay loam.	CL, SC	A-2, A-6, A-7	0-5	85-100	70-95	50-95	20-65	25-45	10-25
	35-60	Stratified sand to gravel.	SP, SM, GP, GM	A-1, A-2, A-3	0-10	40-100	35-100	15-95	2-20	---	NP
FxC2*:											
Fox----------	0-7	Loam----------	ML, CL, CL-ML	A-4	0	95-100	85-100	75-95	55-90	20-30	3-10
	7-25	Clay loam, loam, sandy clay loam, gravelly clay loam, gravelly loam.	CL, SC	A-2, A-6, A-7	0-5	85-100	70-95	50-95	20-65	25-45	10-25
	25-60	Stratified sand to gravel.	SP, SM, GP, GM	A-1, A-2, A-3	0-10	40-100	35-100	15-95	2-20	---	NP
Fox----------	0-6	Clay loam--------	CL	A-6	0	90-100	75-100	75-95	60-80	20-40	10-20
	6-16	Clay loam, loam, gravelly clay loam, sandy clay loam.	CL, SC	A-2, A-6, A-7	0-5	85-100	70-95	50-95	20-65	25-45	10-25
	16-60	Stratified sand to gravel.	SP, SM, GP, GM	A-1, A-2, A-3	0-10	40-100	35-100	15-95	2-20	---	NP
Ge---------- Genesee	0-8	Silt loam--------	ML, CL	A-4, A-6	0	100	100	90-100	75-90	26-40	3-15
	8-41	Silt loam, loam	ML, CL	A-4, A-6	0	100	100	90-100	75-90	26-40	3-15
	41-60	Stratified silt loam to sand.	ML, CL, CL-ML	A-4, A-6	0	90-100	85-100	60-90	50-90	20-35	3-15
GpC, GpD, GpE---- Gilpin	0-4	Silt loam--------	ML, CL, CL-ML	A-4, A-6	0-5	80-95	75-90	70-85	65-80	20-40	4-15
	4-24	Channery loam, silt loam, shaly silt loam, silty clay loam.	GM, ML, CL, CL-ML	A-2, A-4, A-6	0-30	50-95	45-90	35-85	30-80	20-40	4-15
	24-30	Channery loam, very channery silt loam, very shaly silty clay loam, very channery loam.	GM, GC, GM-GC	A-1, A-2, A-4	0-35	25-55	20-50	15-45	15-40	20-40	4-15
	30	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
GrC, GrD2---------- Grayford	0-9	Silt loam--------	CL-ML, CL	A-4, A-6	0	100	100	90-100	70-90	25-35	5-15
	9-28	Silty clay loam, silt loam.	CL	A-6, A-7	0	100	95-100	95-100	85-95	35-50	20-30
	28-49	Clay loam, silty clay loam, silt loam, loam.	CL	A-6, A-7	0-5	95-100	85-100	75-100	60-95	35-50	20-30
	49-67	Clay, silty clay	CH	A-7	0-5	90-100	80-100	75-100	60-95	50-70	30-45
	67	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Ha---------- Haymond	0-11	Silt loam--------	ML	A-4	0	100	100	90-100	80-90	27-36	4-10
	11-42	Silt loam--------	ML	A-4	0	100	100	90-100	80-90	27-36	4-10
	42-60	Silt loam, fine sandy loam, loamy sand.	ML	A-4	0	95-100	90-100	80-100	65-90	27-36	4-10
HkF---------- Hickory	0-10	Loam----------	CL-ML, CL	A-6, A-4	0-5	95-100	90-100	90-100	85-95	20-35	5-15
	10-44	Clay loam--------	CL	A-6, A-7	0-5	100	90-100	80-95	75-90	30-50	15-30
	44-75	Clay loam, sandy loam, loam.	CL-ML, CL	A-4, A-6	0-5	85-100	85-95	80-95	60-80	20-40	5-20
IvA---------- Iva	0-19	Silt loam--------	CL, CL-ML	A-4, A-6	0	100	100	90-100	70-100	25-35	5-15
	19-40	Silty clay loam	CL	A-6, A-7	0	100	100	90-100	80-100	35-50	15-30
	40-60	Silt loam--------	CL, CL-ML	A-4, A-6	0	100	100	90-100	70-90	25-35	5-15

See footnote at end of table.

TABLE 16.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
MbD2, MbE-------- Markland	0-6	Silt loam---------	CL, CL-ML	A-4, A-6	0	100	100	90-100	70-90	25-35	5-15
	6-29	Silty clay, clay, silty clay loam.	CL, CH	A-7	0	100	100	95-100	90-95	45-60	25-35
	29-60	Stratified clay to silt loam.	CL, CH	A-6, A-7	0	100	100	90-100	75-95	35-60	20-35
MeA, MeB--------- Martinsville	0-9	Loam----------	CL, CL-ML	A-4, A-6	0	100	90-100	80-100	60-90	22-33	4-12
	9-46	Clay loam, silty clay loam, sandy clay loam.	CL, SC	A-4, A-6	0	100	90-100	65-90	40-90	20-35	8-20
	46-50	Sandy loam, sandy clay loam, loam.	SM, ML	A-2-4, A-4	0	100	90-100	60-80	30-60	30-40	2-8
	50-60	Stratified sand to silty clay loam.	CL, SC, CL-ML, SM-SC	A-4	0	95-100	85-100	80-95	40-60	<25	4-9
MnB2, MnC2, MnD2, MnE---------- Miami	0-7	Silt loam---------	CL, CL-ML	A-4, A-6	0	100	95-100	80-100	50-90	22-34	6-15
	7-32	Clay loam, silty clay loam, sandy clay loam.	CL	A-6, A-7	0	92-99	89-97	78-95	64-95	35-50	17-31
	32-60	Loam, clay loam, sandy loam.	CL, CL-ML, ML	A-4, A-6	0-3	88-94	83-89	74-87	50-64	17-30	2-14
MnF---------- Miami	0-6	Loam----------	CL, CL-ML	A-4, A-6	0	100	95-100	80-100	50-90	22-34	6-15
	6-24	Clay loam, silty clay loam, sandy clay loam.	CL	A-6, A-7	0	92-99	89-97	78-95	64-95	35-50	17-31
	24-60	Loam, clay loam, sandy loam.	CL, CL-ML, ML	A-4, A-6	0-3	88-94	83-89	74-87	50-64	17-30	2-14
MoC3, MoD3------- Miami	0-7	Clay loam---------	CL	A-6, A-7	0	100	90-100	75-95	65-95	30-45	15-25
	7-30	Clay loam, silty clay loam, sandy clay loam.	CL	A-6, A-7	0	92-99	89-97	78-95	64-95	35-50	17-31
	30-60	Loam, clay loam, sandy loam.	CL, CL-ML, ML	A-4, A-6	0-3	88-94	83-89	74-87	50-64	17-30	2-14
Mp---------- Milford	0-11	Silty clay loam	CL, CH	A-7	0	100	95-100	90-100	80-95	40-60	20-35
	11-48	Silty clay, silty clay loam, clay loam.	CH, CL	A-7	0	100	95-100	90-100	75-100	40-60	20-40
	48-60	Stratified clay to fine sandy loam.	CL	A-6, A-7	0	97-100	95-100	90-100	70-100	30-50	15-30
Mu---------- Montgomery	0-12	Silty clay loam	CL	A-7	0	100	100	100	85-100	40-50	20-30
	12-45	Silty clay loam, silty clay.	CH	A-7	0	100	100	95-100	90-100	50-65	30-42
	45-60	Stratified clay to silty clay loam.	CL, CH	A-7	0	100	100	90-100	85-100	40-55	20-32
OcA, OcB2-------- Ockley	0-13	Loam----------	CL, ML, CL-ML	A-4, A-6	0	100	95-100	80-100	60-90	22-33	3-12
	13-33	Silty clay loam, clay loam.	CL	A-6, A-7	0	100	75-100	65-90	50-90	35-50	15-30
	33-54	Gravelly clay loam, sandy clay loam, gravelly sandy clay loam.	CL, SC, GC	A-6, A-7	0-2	70-85	45-75	40-70	35-55	30-50	15-30
	54-60	Stratified sand to gravelly sand.	SP, SP-SM, GP, GP-GM	A-1	1-5	30-70	20-55	5-20	2-10	---	NP
PkC2, PkD-------- Parke	0-7	Silt loam---------	CL, CL-ML	A-4, A-6	0	100	100	90-100	70-100	25-35	5-15
	7-30	Silty clay loam	CL	A-6, A-7	0	95-100	95-100	90-100	80-100	25-45	10-25
	30-80	Sandy clay loam, loam, clay loam.	SC	A-2, A-6	0-3	90-100	85-95	75-90	30-50	25-35	10-15

TABLE 16.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
Pm----------	0-11	Silty clay loam	CL	A-6	0	100	100	95-100	75-95	30-40	10-20
Patton	11-50	Silty clay loam	CL, CH, ML, MH	A-7	0	100	100	95-100	80-100	40-55	15-25
	50-60	Stratified silt loam to silty clay loam.	CL	A-6	0	100	100	95-100	75-95	25-40	10-20
PnB----------	0-8	Silt loam--------	CL, CL-ML	A-4, A-6	0	100	100	85-100	65-100	20-35	5-15
Pekin	8-21	Silt loam, silty clay loam.	CL, CL-ML	A-4, A-6	0	100	100	90-100	70-100	25-35	5-15
	21-56	Silt loam, silty clay loam.	CL, CL-ML	A-4, A-6	0	100	100	88-98	65-90	25-35	5-15
	56-60	Stratified fine sandy loam to silty clay loam.	CL, CL-ML	A-4, A-6	0	100	100	80-95	50-85	20-30	5-15
PpA, PpB2--------	0-13	Silt loam--------	CL	A-4, A-6	0	100	100	90-100	80-95	25-35	8-15
Pike	13-50	Silty clay loam, silt loam.	CL	A-6, A-7	0	100	95-100	85-100	80-90	30-45	10-25
	50-74	Silty clay loam, loam, silt loam, sandy clay loam, clay loam.	CL, SC	A-6, A-2-6	0	80-90	70-90	60-90	30-80	20-35	10-20
	74-80	Stratified sand to clay loam.	CL-ML, ML, SM, SM-SC	A-4, A-2-4, A-1	0	70-90	65-85	35-70	15-65	<20	NP-5
PrA, PrB, PrC, PrD, PrE--------	0-11	Fine sandy loam	SM, SC, ML, CL	A-4, A-2-4	0	100	100	60-85	30-55	<25	NP-10
Princeton	11-40	Sandy clay loam, fine sandy loam, loam.	SC, CL	A-6	0	100	100	70-90	35-70	25-35	10-15
	40-53	Loamy fine sand, loam.	SC, SM-SC, CL, CL-ML	A-4, A-6, A-2-4, A-2-6	0	100	100	60-90	30-70	15-25	5-15
	53-60	Stratified fine sand to silt.	SM, ML, CL-ML, SM-SC	A-2-4, A-4	0	100	100	65-90	20-55	<20	NP-5
Ps. Pits											
Rd----------	0-11	Silt loam--------	ML, CL-ML	A-4	0	100	90-100	90-100	85-100	24-36	4-10
Reesville	11-46	Silty clay loam, silt loam.	CL, CL-ML	A-6, A-7, A-4	0	100	90-100	90-100	90-100	22-50	4-28
	46-60	Loam, silt loam	ML, CL, CL-ML	A-4, A-6	0	90-100	85-95	80-90	70-90	20-40	3-18
Re----------	0-18	Clay loam--------	CL	A-7, A-6	0	100	100	95-100	85-95	30-44	15-26
Rensselaer	18-47	Clay loam, silty clay loam.	CL	A-6, A-7	0	95-100	90-100	80-100	60-80	33-47	15-26
	47-60	Stratified fine sand to clay loam.	CL, SC, CL-ML, SM-SC	A-4, A-2	0	95-100	90-100	60-95	20-70	<30	4-9
Ro----------	0-20	Loam, silt loam	ML, CL-ML, CL	A-4, A-6	0	90-100	90-100	80-100	65-95	20-35	NP-12
Ross	20-60	Loam, silt loam, silty clay loam.	ML, CL, CL-ML	A-6, A-4, A-7	0	90-100	85-100	70-100	55-95	22-45	3-20
RuB----------	0-14	Silt loam--------	CL, CL-ML	A-4, A-6	0	100	95-100	80-100	50-90	20-35	5-15
Russell	14-22	Silty clay loam, silt loam.	CL	A-6, A-7	0	100	100	95-100	85-95	35-50	20-35
	22-59	Clay loam, loam	CL	A-6, A-7	0	90-100	90-95	80-90	65-75	35-50	17-31
	59-65	Loam, clay loam	CL, ML, CL-ML	A-4, A-6	0-3	85-95	80-90	75-85	50-65	<30	2-14
Sh----------	0-8	Silt loam--------	CL, CL-ML	A-4, A-6	0	100	100	90-100	65-90	22-36	6-15
Shoals	8-60	Silt loam, loam, silty clay loam.	CL, CL-ML	A-4, A-6	0	100	100	90-100	75-85	25-40	4-15

TABLE 16.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
Sn Sloan	0-18	Silty clay loam	CL	A-6, A-7	0	100	95-100	85-100	70-95	35-45	12-20
	18-55	Silty clay loam, clay loam, silt loam.	CL, ML	A-6, A-7, A-4	0	100	90-100	85-100	75-95	30-45	8-18
	55-60	Stratified sand to silty clay loam.	ML, CL	A-4, A-6	0	95-100	70-100	60-95	50-90	25-40	3-15
St Stonelick	0-9	Sandy loam	SM, ML, SM-SC, CL-ML	A-4, A-2	0	85-100	70-100	45-75	25-55	<24	NP-6
	9-60	Stratified loam to loamy sand.	SM, SP-SM	A-2, A-4, A-3, A-1-B	0	85-100	70-95	40-60	5-40	<15	NP
Ta Taggart	0-12	Silt loam	CL, CL-ML	A-4, A-6	0	100	100	90-100	70-90	25-35	5-15
	12-40	Silty clay loam, clay loam, silt loam.	CL, CH	A-6, A-7	0	100	100	95-100	85-95	35-55	20-30
	40-80	Stratified silty clay loam to loam.	CL	A-6, A-7	0-1	90-100	75-100	65-95	50-85	30-45	15-25
VoA Vigo	0-10	Silt loam	CL, CL-ML	A-4, A-6	0	100	95-100	90-100	80-95	25-35	5-15
	10-21	Silt loam	CL, CL-ML	A-4, A-6	0	100	95-100	90-100	80-95	25-35	5-15
	21-46	Silty clay loam, silt loam.	CL, CH	A-6, A-7	0	100	95-100	90-100	80-95	35-55	20-40
	46-80	Clay loam, loam	CL	A-4, A-6	0	95-100	90-100	80-95	55-80	20-40	8-20
Wa Wakeland	0-6	Silt loam	ML	A-4	0	100	100	90-100	80-90	27-36	4-10
	6-60	Silt loam	ML	A-4	0	100	100	90-100	80-90	27-36	4-10
WcG Weikert	0-3	Channery silt loam.	GM, ML	A-1, A-2, A-4	0-10	35-70	35-70	25-65	20-55	30-40	4-10
	3-17	Shaly loam, channery silt loam, very channery silt loam, very shaly silt loam, cherty loam.	GM, GP	A-1, A-2	0-20	15-60	10-45	5-35	5-35	28-36	3-9
	17	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
WfC Wellston	0-7	Silt loam	ML	A-4	0	95-100	90-100	85-100	70-95	25-35	3-10
	7-46	Silt loam, silty clay loam.	CL, CL-ML	A-6, A-4	0-5	75-100	70-100	60-95	60-90	25-40	5-20
	46-50	Silt loam, loam, gravelly loam.	CL-ML, CL, SC, SM-SC	A-4, A-6	0-10	65-90	65-90	60-90	40-65	20-35	5-15
	50	Weathered bedrock	---	---	---	---	---	---	---	---	---
Wr Whitaker	0-9	Loam	CL, CL-ML	A-4, A-6	0	100	95-100	80-100	60-90	22-33	4-12
	9-49	Clay loam, loam, silty clay loam.	CL	A-6, A-7	0	100	95-100	90-100	70-80	30-47	12-26
	49-60	Stratified coarse sand to clay.	CL, SC, ML, SM	A-4	0	98-100	98-100	60-85	40-60	15-25	3-9
Wu Wilbur	0-5	Silt loam	CL, CL-ML	A-4, A-6	0	100	100	90-100	70-90	25-35	5-15
	5-60	Silt loam	CL, CL-ML	A-4, A-6	0	100	100	90-100	70-90	25-35	5-15
XeB2 Xenia	0-7	Silt loam	CL, CL-ML	A-4, A-6	0	100	100	90-100	70-100	25-35	5-15
	7-38	Silty clay loam	CL	A-6, A-7	0	100	100	90-100	80-95	35-50	15-30
	38-51	Clay loam, loam	CL	A-6, A-7	0-5	92-100	90-95	75-95	65-75	35-50	15-30
	51-60	Loam	CL, ML, SC, SM	A-4, A-6	0-5	85-95	80-90	75-90	40-65	15-30	NP-15

TABLE 16.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
ZaB, ZaC---------- Zanesville	0-9	Silt loam--------	CL-ML, CL, ML	A-4, A-6	0	95-100	95-100	90-100	80-100	25-40	4-15
	9-34	Silt loam, silty clay loam.	CL, CL-ML	A-4, A-6	0	95-100	95-100	90-100	80-100	25-40	5-20
	34-54	Silt loam, silty clay loam.	ML, CL, CL-ML	A-4, A-6	0-3	90-100	85-100	80-100	60-100	20-40	2-20
	54-56	Sandy clay loam, clay loam, channery sandy clay loam.	SC, CL, SM, GM	A-6, A-4, A-2, A-1-B	0-10	65-100	50-95	40-95	20-85	20-40	2-20
	56	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Zp---------- Zipp	0-11	Silty clay loam	CL, CH	A-7, A-6	0	100	100	95-100	90-95	35-55	20-30
	11-41	Clay, silty clay, silty clay loam.	CL, CH	A-7	0	100	100	95-100	90-95	45-60	25-35
	41-60	Clay, silty clay loam.	CL, CH	A-7	0	100	100	90-100	75-95	45-60	25-35

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 17.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS

[The symbol < means less than; > means more than. Entries under "Erosion factors--T" apply to the entire profile. Entries under "Wind erodibility group" and "Organic matter" apply only to the surface layer. Absence of an entry indicates that data were not available or were not estimated]

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Reaction	Salinity	Shrink-swell potential	Erosion factors		Wind erodibility group	Organic matter
									K	T		
	In	Pct	G/cm3	In/hr	In/in	pH	Mmhos/cm					Pct
AfA, AfB, AfC2---	0-8	18-27	1.25-1.40	0.6-2.0	0.22-0.24	4.5-7.3	<2	Low-------	0.37	5	5	.5-2
Alford	8-40	22-30	1.35-1.50	0.6-2.0	0.18-0.20	4.5-6.5	<2	Moderate	0.37			
	40-70	8-20	1.30-1.45	0.6-2.0	0.20-0.22	4.5-7.3	<2	Low-------	0.37			
Ar---	0-15	24-33	1.30-1.45	0.6-2.0	0.21-0.23	6.1-7.3	<2	Moderate	0.28	5	6	2-4
Armiesburg	15-60	24-33	1.30-1.45	0.6-2.0	0.18-0.20	6.1-7.3	<2	Moderate	0.28			
AvB---	0-14	20-27	1.40-1.60	0.6-2.0	0.22-0.24	4.5-6.5	<2	Moderate	0.43	4	6	1-3
Ava	14-29	22-35	1.40-1.60	0.2-0.6	0.18-0.20	4.5-5.5	<2	Moderate	0.43			
	29-62	25-35	1.60-1.75	0.06-0.2	0.09-0.10	4.5-5.5	<2	Moderate	0.43			
	62-80	20-30	1.65-1.80	<0.06	0.05-0.08	4.5-5.5	<2	Moderate	0.43			
Ba---	0-7	10-18	1.30-1.50	0.2-0.6	0.22-0.24	4.5-6.5	<2	Low-------	0.43	3	5	.5-2
Banlic	7-22	12-18	1.40-1.60	0.06-0.2	0.20-0.22	4.5-6.0	<2	Low-------	0.43			
	22-70	10-20	1.65-1.80	0.06-0.2	0.11-0.12	4.5-6.0	<2	Low-------	0.43			
Bd---	0-7	15-26	1.30-1.45	0.6-2.0	0.20-0.24	5.1-7.3	<2	Low-------	0.43	4	5	1-3
Bartle	7-26	22-35	1.40-1.60	0.6-2.0	0.20-0.22	4.5-5.5	<2	Low-------	0.43			
	26-57	22-35	1.60-1.80	<0.06	0.06-0.08	4.5-5.5	<2	Low-------	0.43			
	57-60	22-35	1.40-1.60	0.2-0.6	0.06-0.08	5.1-7.3	<2	Low-------	0.43			
BeB, BeC2---	0-7	10-16	1.30-1.45	0.6-2.0	0.22-0.24	4.5-6.0	<2	Low-------	0.43	4	5	1-2
Bedford	7-27	27-32	1.30-1.45	0.6-2.0	0.18-0.20	4.5-5.5	<2	Moderate	0.43			
	27-49	28-35	1.50-1.70	<0.06	0.06-0.08	4.5-5.5	<2	Moderate	0.43			
	49-80	35-55	1.30-1.50	0.2-0.6	0.06-0.08	4.5-5.5	<2	Moderate	0.32			
BfG---	0-6	5-23	1.20-1.50	0.6-6.0	0.08-0.12	4.5-6.5	<2	Low-------	0.24	3	---	.5-3
Berks	6-24	5-20	1.20-1.60	0.6-2.0	0.04-0.10	4.5-6.5	<2	Low-------	0.17			
	24-30	5-20	1.20-1.60	2.0-6.0	0.04-0.10	4.5-6.5	<2	Low-------	0.17			
	30	---	---	---	---	---	---	----------	----			
BmC---	0-32	3-10	1.60-1.80	6.0-20	0.07-0.12	5.1-7.3	<2	Low-------	0.15	5	1	.5-2
Bloomfield	32-61	6-18	1.60-1.80	6.0-20	0.06-0.17	5.1-6.5	<2	Low-------	0.15			
	61-70	3-18	1.70-1.90	6.0-20	0.06-0.08	5.1-7.3	<2	Low-------	0.15			
Bo---	0-8	18-25	1.20-1.40	0.6-2.0	0.22-0.24	6.6-7.3	<2	Low-------	0.43	5	6	1-3
Bonnie	8-60	18-25	1.40-1.60	0.2-0.6	0.20-0.22	4.5-5.5	<2	Low-------	0.43			
Br---	0-17	27-32	1.40-1.55	0.6-2.0	0.21-0.24	6.1-7.3	<2	Moderate	0.28	5	7	3-5
Brookston	17-49	27-35	1.40-1.60	0.6-2.0	0.15-0.19	6.6-7.3	<2	Moderate	0.28			
	49-60	15-32	1.45-1.70	0.6-2.0	0.05-0.19	7.4-8.4	<2	Moderate	0.28			
ChF---	0-9	12-24	1.30-1.50	0.6-2.0	0.20-0.24	5.6-7.3	<2	Low-------	0.32	5	5	1-3
Chetwynd	9-44	22-35	1.40-1.60	0.6-2.0	0.13-0.17	4.5-5.5	<2	Moderate	0.32			
	44-57	20-30	1.35-1.60	0.6-2.0	0.11-0.17	5.1-6.0	<2	Low-------	0.32			
	57-72	3-10	1.40-1.60	2.0-6.0	0.12-0.19	5.1-6.0	<2	Low-------	0.15			
CnC2, CnC3, CnD2, CnD3---	0-16	15-25	1.30-1.50	0.6-2.0	0.22-0.24	4.5-7.3	<2	Low-------	0.37	4-3	6	1-3
Cincinnati	16-23	22-35	1.45-1.65	0.6-2.0	0.15-0.19	4.5-5.5	<2	Low-------	0.37			
	23-47	24-35	1.60-1.85	0.06-0.2	0.08-0.12	4.5-6.5	<2	Moderate	0.37			
	47-80	18-40	1.55-1.75	0.06-0.2	0.14-0.18	4.5-7.8	<2	Low-------	0.37			
CrA---	0-8	11-22	1.40-1.55	0.6-2.0	0.20-0.24	5.1-7.3	<2	Low-------	0.43	3	5	1-3
Crosby	8-36	35-40	1.50-1.70	0.06-0.2	0.15-0.20	5.1-7.3	<2	Moderate	0.43			
	36-60	15-32	1.70-2.00	0.06-0.2	0.05-0.19	7.9-8.4	<2	Low-------	0.43			

TABLE 17.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Reaction	Salinity	Shrink-swell potential	Erosion factors		Wind erodibility group	Organic matter
									K	T		
	In	Pct	G/cm³	In/hr	In/in	pH	Mmhos/cm					Pct
CsB2*:												
Crosby	0-8	11-22	1.40-1.55	0.6-2.0	0.20-0.24	5.1-6.5	<2	Low	0.43	3	5	1-3
	8-28	25-40	1.50-1.70	0.06-0.2	0.15-0.20	5.1-7.3	<2	Moderate	0.43			
	28-60	15-32	1.70-2.00	0.06-0.2	0.05-0.19	7.9-8.4	<2	Low	0.43			
Miami	0-7	11-22	1.40-1.55	0.6-2.0	0.20-0.24	5.6-7.3	<2	Low	0.37	5	5	.5-3
	7-37	25-35	1.45-1.65	0.6-2.0	0.15-0.20	5.6-6.0	<2	Moderate	0.37			
	37-60	15-32	1.55-1.90	0.2-0.6	0.05-0.19	6.6-8.4	<2	Low	0.37			
EsC2	0-5	15-26	1.30-1.45	0.6-2.0	0.22-0.24	5.6-7.3	<2	Low	0.37	5	5	.5-2
Elkinsville	5-64	22-30	1.40-1.60	0.6-2.0	0.18-0.22	4.5-6.0	<2	Moderate	0.37			
	64-80	16-30	1.45-1.65	0.6-2.0	0.15-0.20	4.5-5.5	<2	Moderate	0.37			
Ev	0-8	27-34	1.30-1.45	0.6-2.0	0.21-0.23	6.1-7.3	<2	Moderate	0.37	5	7	1-3
Evansville	8-50	25-34	1.40-1.55	0.6-2.0	0.18-0.20	6.1-7.8	<2	Moderate	0.37			
	50-60	25-34	1.40-1.55	0.6-2.0	0.19-0.21	6.6-8.4	<2	Low	0.37			
FcA	0-10	11-22	1.40-1.55	0.6-2.0	0.22-0.24	5.1-6.5	<2	Low	0.37	5	5	1-3
Fincastle	10-35	20-35	1.45-1.65	0.2-0.6	0.18-0.20	5.1-6.0	<2	Moderate	0.37			
	35-52	20-35	1.45-1.65	0.2-0.6	0.15-0.19	5.1-7.3	<2	Moderate	0.37			
	52-60	20-30	1.55-1.90	0.06-0.2	0.05-0.19	7.4-8.4	<2	Low	0.37			
FoA, FoB2	0-11	10-17	1.35-1.55	0.6-2.0	0.20-0.24	5.1-7.3	<2	Low	0.32	4	5	1-3
Fox	11-35	25-35	1.55-1.65	0.6-2.0	0.15-0.19	5.6-8.4	<2	Moderate	0.32			
	35-60	0-2	1.30-2.20	6.0-20	0.02-0.04	7.4-8.4	<2	Low	0.10			
FxC2*:												
Fox	0-7	10-17	1.35-1.55	0.6-2.0	0.20-0.24	5.1-7.3	<2	Low	0.32	4	5	1-3
	7-25	25-35	1.55-1.65	0.6-2.0	0.15-0.19	5.6-8.4	<2	Moderate	0.32			
	25-60	0-2	1.30-2.20	6.0-20	0.02-0.04	7.4-8.4	<2	Low	0.10			
Fox	0-6	27-35	1.55-1.65	0.6-2.0	0.17-0.19	5.1-7.3	<2	Moderate	0.32	3	6	.5-2
	6-16	25-35	1.55-1.65	0.6-2.0	0.15-0.19	5.6-8.4	<2	Moderate	0.32			
	16-60	0-2	1.30-2.20	6.0-20	0.02-0.04	7.4-8.4	<2	Low	0.10			
Ge	0-8	18-30	1.30-1.50	0.6-2.0	0.20-0.24	6.1-7.8	<2	Low	0.37	5	5	2-4
Genesee	8-41	18-27	1.30-1.50	0.6-2.0	0.17-0.22	6.1-8.4	<2	Low	0.37			
	41-60	10-20	1.30-1.50	0.6-2.0	0.19-0.21	7.4-8.4	<2	Low	0.37			
GpC, GpD, GpE	0-4	15-27	1.20-1.40	0.6-2.0	0.12-0.18	4.5-5.5	<2	Low	0.32	3	---	1-4
Gilpin	4-24	18-35	1.20-1.50	0.6-2.0	0.10-0.16	4.5-5.5	<2	Low	0.28			
	24-30	15-35	1.20-1.50	0.6-2.0	0.06-0.10	4.5-5.5	<2	Low	0.28			
	30	---	---	---	---	---	---	---	---			
GrC, GrD2	0-9	17-27	1.25-1.40	0.6-2.0	0.20-0.24	4.5-7.3	<2	Low	0.37	5	5	.5-2
Grayford	9-28	25-35	1.35-1.50	0.6-2.0	0.18-0.20	4.5-5.5	<2	Moderate	0.37			
	28-49	25-35	1.40-1.60	0.6-2.0	0.16-0.20	4.5-5.5	<2	Moderate	0.37			
	49-67	45-60	1.40-1.60	0.06-0.2	0.09-0.11	5.6-7.3	<2	High	0.37			
	67	---	---	---	---	---	---	---	---			
Ha	0-11	10-18	1.30-1.45	0.6-2.0	0.22-0.24	5.6-7.3	<2	Low	0.37	5	5	1-3
Haymond	11-42	10-18	1.30-1.45	0.6-2.0	0.20-0.22	5.6-7.3	<2	Low	0.37			
	42-60	10-18	1.30-1.45	0.6-2.0	0.20-0.22	6.1-7.3	<2	Low	0.37			
HkF	0-10	19-25	1.45-1.65	0.6-2.0	0.20-0.22	4.5-6.0	<2	Low	0.37	5	6	2-4
Hickory	10-44	27-35	1.60-1.80	0.6-2.0	0.15-0.19	4.5-5.5	<2	Moderate	0.37			
	44-75	15-22	1.70-1.90	0.6-2.0	0.11-0.19	6.5-8.4	<2	Low	0.37			
IvA	0-19	18-27	1.25-1.40	0.6-2.0	0.22-0.24	5.1-7.3	<2	Low	0.43	4	5	1-3
Iva	19-40	22-30	1.35-1.55	0.06-0.2	0.18-0.20	5.1-6.5	<2	Moderate	0.43			
	40-60	10-20	1.35-1.55	0.6-2.0	0.20-0.22	5.6-6.5	<2	Low	0.43			
MbD2, MbE	0-6	20-30	1.30-1.45	0.6-2.0	0.22-0.24	5.6-7.3	<2	Low	0.43	3	5	1-3
Markland	6-29	35-55	1.55-1.70	0.06-0.2	0.11-0.13	5.1-6.5	<2	High	0.32			
	29-60	35-50	1.55-1.70	0.06-0.2	0.09-0.11	7.9-8.4	<2	High	0.32			

See footnote at end of table.

TABLE 17.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Reaction	Salinity	Shrink-swell potential	Erosion factors		Wind erodibility group	Organic matter
									K	T		
	In	Pct	G/cm3	In/hr	In/in	pH	Mmhos/cm					Pct
MeA, MeB	0-9	8-17	1.30-1.45	0.6-2.0	0.20-0.24	5.6-7.3	<2	Low	0.37	5	5	1-3
Martinsville	9-46	18-30	1.40-1.60	0.6-2.0	0.17-0.20	5.1-6.0	<2	Moderate	0.37			
	46-50	10-25	1.40-1.60	0.6-2.0	0.12-0.14	5.6-6.5	<2	Low	0.24			
	50-60	3-23	1.50-1.70	0.6-2.0	0.19-0.21	6.5-8.4	<2	Low	0.24			
MnB2, MnC2, MnD2, MnE	0-7	11-22	1.40-1.55	0.6-2.0	0.20-0.24	5.6-7.3	<2	Low	0.37	5	5	.5-3
Miami	7-32	25-35	1.45-1.65	0.6-2.0	0.15-0.20	5.6-7.3	<2	Moderate	0.37			
	32-60	15-32	1.55-1.90	0.2-0.6	0.05-0.19	6.6-8.4	<2	Low	0.37			
MnF	0-6	11-22	1.40-1.55	0.6-2.0	0.20-0.24	5.6-7.3	<2	Low	0.37	5	5	.5-3
Miami	6-24	25-35	1.45-1.65	0.6-2.0	0.15-0.20	5.6-7.3	<2	Moderate	0.37			
	24-60	15-32	1.55-1.90	0.2-0.6	0.05-0.19	6.6-8.4	<2	Low	0.37			
MoC3, MoD3	0-7	27-35	1.45-1.60	0.6-2.0	0.18-0.20	5.6-7.3	<2	Moderate	0.37	4	6	.5-3
Miami	7-30	25-35	1.45-1.65	0.6-2.0	0.15-0.20	5.6-7.3	<2	Moderate	0.37			
	30-60	15-32	1.55-1.90	0.2-0.6	0.05-0.19	6.6-8.4	<2	Low	0.37			
Mp	0-11	35-42	1.35-1.55	0.6-2.0	0.12-0.23	5.6-7.3	<2	High	0.28	5	4	5-6
Milford	11-48	35-42	1.45-1.65	0.2-0.6	0.18-0.20	5.1-7.3	<2	Moderate	0.43			
	48-60	20-30	1.50-1.70	0.2-0.6	0.20-0.22	6.5-8.4	<2	Moderate	0.43			
Mu	0-12	35-40	1.35-1.55	0.2-0.6	0.20-0.23	6.6-7.8	<2	High	0.37	5	7	3-6
Montgomery	12-45	35-55	1.45-1.65	<0.06	0.11-0.18	6.6-7.8	<2	High	0.37			
	45-60	35-48	1.50-1.70	<0.06	0.18-0.20	7.4-8.4	<2	Moderate	0.37			
OcA, OcB2	0-13	11-22	1.30-1.45	0.6-2.0	0.20-0.24	5.6-6.5	<2	Low	0.37	5	5	.5-3
Ockley	13-33	27-35	1.45-1.60	0.6-2.0	0.15-0.20	4.5-6.0	<2	Moderate	0.37			
	33-54	20-35	1.40-1.55	0.6-2.0	0.12-0.14	5.6-6.5	<2	Moderate	0.24			
	54-60	2-5	1.60-1.80	>20	0.02-0.04	7.4-8.4	<2	Low	0.10			
PkC2, PkD	0-7	18-27	1.25-1.40	0.6-2.0	0.22-0.24	5.1-6.5	<2	Low	0.37	5	5	.5-2
Parke	7-30	27-35	1.30-1.45	0.6-2.0	0.18-0.20	4.5-5.0	<2	Moderate	0.37			
	30-80	20-30	1.55-1.65	0.6-2.0	0.16-0.18	4.5-5.5	<2	Low	0.28			
Pm	0-11	22-30	1.15-1.35	0.6-2.0	0.21-0.23	6.6-7.3	<2	Moderate	0.28	5	7	3-5
Patton	11-50	27-35	1.25-1.45	0.6-2.0	0.18-0.20	6.1-7.8	<2	Moderate	0.28			
	50-60	22-35	1.30-1.50	0.2-2.0	0.18-0.22	6.5-8.4	<2	Moderate	0.28			
PnB	0-8	15-26	1.30-1.45	0.6-2.0	0.22-0.24	5.6-7.3	<2	Low	0.43	4	5	1-3
Pekin	8-21	27-35	1.40-1.60	0.6-2.0	0.20-0.22	4.5-5.5	<2	Low	0.43			
	21-56	22-30	1.60-1.80	<0.06	0.06-0.08	4.5-6.0	<2	Low	0.43			
	56-60	20-34	1.40-1.60	0.6-2.0	0.06-0.08	5.6-7.3	<2	Low	0.43			
PpA, PpB2	0-13	18-27	1.25-1.40	0.6-2.0	0.22-0.24	5.1-7.3	<2	Low	0.37	5	5	.5-2
Pike	13-50	27-35	1.30-1.45	0.6-2.0	0.18-0.22	4.5-5.5	<2	Low	0.37			
	50-74	18-35	1.30-1.45	0.6-2.0	0.12-0.18	4.5-5.5	<2	Low	0.37			
	74-80	14-20	1.45-1.65	2.0-6.0	0.05-0.12	4.5-8.4	<2	Low	0.37			
PrA, PrB, PrC, PrD, PrE	0-11	12-20	1.35-1.50	0.6-2.0	0.13-0.18	5.6-7.3	<2	Low	0.24	5	3	.5-2
Princeton	11-40	18-25	1.40-1.55	0.6-2.0	0.16-0.18	5.1-6.5	<2	Low	0.32			
	40-53	8-18	1.40-1.55	0.6-2.0	0.12-0.14	5.1-7.3	<2	Low	0.32			
	53-60	4-10	1.45-1.60	2.0-6.0	0.06-0.08	6.1-8.4	<2	Low	0.17			
Ps. Pits												
Rd	0-11	12-20	1.20-1.45	0.6-2.0	0.17-0.24	5.6-7.3	<2	Low	0.37	5	5	2-4
Reesville	11-46	22-35	1.30-1.55	0.2-0.6	0.17-0.22	5.1-8.4	<2	Moderate	0.37			
	46-60	12-25	1.20-1.40	0.2-0.6	0.15-0.18	7.4-8.4	<2	Low	0.37			
Re	0-18	27-35	1.40-1.55	0.06-0.2	0.21-0.23	6.1-7.3	<2	Moderate	0.28	5	6	2-6
Rensselaer	18-47	27-35	1.40-1.60	0.06-0.2	0.15-0.19	6.1-7.3	<2	Moderate	0.28			
	47-60	2-30	1.50-1.70	0.6-2.0	0.19-0.21	6.6-8.4	<2	Low	0.28			

TABLE 17.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Reaction	Salinity	Shrink-swell potential	Erosion factors		Wind erodibility group	Organic matter
									K	T		
	In	Pct	G/cm³	In/hr	In/in	pH	Mmhos/cm					Pct
Ro	0-20	15-27	1.20-1.45	0.6-2.0	0.19-0.24	6.1-7.8	<2	Low	0.32	5	5	3-5
Ross	20-60	18-32	1.20-1.50	0.6-2.0	0.16-0.22	6.1-8.4	<2	Low	0.32			
RuB	0-14	11-25	1.30-1.45	0.6-2.0	0.21-0.24	5.6-7.3	<2	Low	0.37	5	5	.5-2
Russell	14-22	25-33	1.40-1.60	0.6-2.0	0.18-0.20	4.5-6.0	<2	Moderate	0.37			
	22-59	23-33	1.40-1.60	0.6-2.0	0.15-0.19	5.6-7.3	<2	Moderate	0.37			
	59-65	14-30	1.60-1.80	0.2-0.6	0.05-0.19	7.4-8.4	<2	Low	0.37			
Sh	0-8	18-27	1.30-1.50	0.6-2.0	0.22-0.24	6.1-7.8	<2	Low	0.37	5	5	2-5
Shoals	8-60	18-32	1.35-1.55	0.6-2.0	0.17-0.22	6.1-7.8	<2	Low	0.37			
Sn	0-18	27-33	1.25-1.50	0.6-2.0	0.18-0.22	6.1-7.8	<2	Moderate	0.37	5	6	3-6
Sloan	18-55	22-35	1.25-1.55	0.2-0.6	0.15-0.19	6.1-8.4	<2	Moderate	0.37			
	55-60	10-30	1.20-1.50	0.2-2.0	0.13-0.18	6.6-8.4	<2	Low	0.37			
St	0-9	8-18	1.25-1.50	2.0-6.0	0.09-0.14	7.4-8.4	<2	Low	0.24	5	3	.5-2
Stonelick	9-60	5-18	1.20-1.55	2.0-6.0	0.05-0.11	7.4-8.4	<2	Low	0.24			
Ta	0-12	12-20	1.30-1.45	0.6-2.0	0.22-0.24	4.5-7.3	<2	Low	0.37	5	5	1-3
Taggart	12-40	25-35	1.40-1.60	0.06-0.2	0.18-0.20	4.5-6.0	<2	Moderate	0.37			
	40-80	20-30	1.40-1.60	0.6-2.0	0.19-0.21	4.5-5.5	<2	Low	0.37			
VoA	0-10	10-16	1.30-1.45	0.6-2.0	0.22-0.24	4.5-7.3	<2	Low	0.43	3	5	.5-2
Vigo	10-21	12-24	1.35-1.50	0.6-2.0	0.20-0.22	4.5-5.5	<2	Low	0.43			
	21-46	24-35	1.40-1.55	<0.06	0.18-0.22	4.5-5.5	<2	Moderate	0.43			
	46-80	20-30	1.40-1.55	<0.06	0.14-0.16	5.1-7.3	<2	Moderate	0.43			
Wa	0-6	10-17	1.30-1.50	0.6-2.0	0.22-0.24	5.6-7.3	<2	Low	0.37	5	5	1-3
Wakeland	6-60	10-17	1.30-1.50	0.6-2.0	0.20-0.22	5.6-7.3	<2	Low	0.37			
WcG	0-3	15-27	1.20-1.40	2.0-6.0	0.08-0.14	4.5-6.0	<2	Low	0.28	2	---	1-3
Weikert	3-17	15-27	1.20-1.40	2.0-6.0	0.04-0.08	4.5-6.0	<2	Low	0.28			
	17	---	---	---	---	---	---	---	---			
WfC	0-7	13-27	1.30-1.50	0.6-2.0	0.18-0.22	5.1-6.5	<2	Low	0.37	4	6	1-3
Wellston	7-46	18-35	1.30-1.65	0.6-2.0	0.17-0.21	4.5-6.0	<2	Low	0.37			
	46-50	15-30	1.30-1.60	0.6-2.0	0.12-0.17	4.5-6.0	<2	Low	0.37			
	50	---	---	---	---	---	---	---	---			
Wr	0-9	8-17	1.30-1.45	0.6-2.0	0.20-0.24	5.6-7.3	<2	Low	0.37	5	5	1-3
Whitaker	9-49	18-30	1.40-1.60	0.6-2.0	0.15-0.19	5.1-7.3	<2	Moderate	0.37			
	49-60	3-18	1.50-1.70	0.6-6.0	0.19-0.21	6.6-8.4	<2	Low	0.37			
Wu	0-5	10-17	1.30-1.45	0.6-2.0	0.22-0.24	5.6-7.3	<2	Low	0.37	5	5	1-3
Wilbur	5-60	10-17	1.30-1.45	0.6-2.0	0.20-0.22	5.6-7.3	<2	Low	0.37			
XeB2	0-7	11-22	1.40-1.55	0.6-2.0	0.22-0.24	6.6-7.3	<2	Low	0.37	5	5	1-3
Xenia	7-38	27-35	1.45-1.65	0.2-0.6	0.18-0.20	5.1-6.0	<2	Moderate	0.37			
	38-51	27-35	1.45-1.65	0.2-0.6	0.15-0.19	5.1-7.3	<2	Moderate	0.37			
	51-60	20-27	1.55-1.90	0.2-0.6	0.05-0.19	7.4-8.4	<2	Low	0.37			
ZaB, ZaC	0-9	12-27	1.35-1.40	0.6-2.0	0.19-0.23	4.5-5.5	<2	Low	0.37	3	---	1-2
Zanesville	9-34	18-35	1.35-1.45	0.6-2.0	0.17-0.22	4.5-5.5	<2	Low	0.37			
	34-54	18-33	1.50-1.75	0.06-0.2	0.08-0.12	4.5-5.5	<2	Low	0.37			
	54-56	20-40	1.50-1.70	0.2-2.0	0.08-0.12	4.5-5.5	<2	Low	0.28			
	56	---	---	---	---	---	---	---	---			
Zp	0-11	30-45	1.40-1.55	0.2-2.0	0.12-0.21	5.6-7.3	<2	High	0.28	5	4	1-3
Zipp	11-41	35-55	1.55-1.70	<0.06	0.11-0.13	6.1-7.3	<2	High	0.28			
	41-60	35-50	1.55-1.70	<0.06	0.08-0.10	7.4-8.4	<2	High	0.28			

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 18.--SOIL AND WATER FEATURES

["Flooding" and "water table" and terms such as "rare," "brief," and "apparent" are explained in the text. The symbol > means more than. Absence of an entry indicates that the feature is not a concern]

Soil name and map symbol	Hydrologic group	Flooding			High water table			Bedrock		Potential frost action	Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness		Uncoated steel	Concrete
					Ft			In				
AfA, AfB, AfC2---- Alford	B	None--------	---	---	>6.0	---	---	>60	---	High-----	Moderate	High.
Ar---------- Armiesburg	B	Frequent----	Brief-----	Oct-Jun	>6.0	---	---	>60	---	High-----	Moderate	Low.
AvB---------- Ava	C	None--------	---	---	2.0-4.0	Perched	Mar-Jun	>60	---	High-----	Moderate	High.
Ba---------- Banlic	C	Rare--------	---	---	1.0-3.0	Perched	Jan-Jun	>60	---	High-----	High-----	High.
Bd---------- Bartle	D	None--------	---	---	1.0-2.0	Perched	Jan-Apr	>60	---	High-----	High-----	High.
BeB, BeC2---------- Bedford	C	None--------	---	---	2.0-4.0	Perched	Mar-Apr	>60	---	High-----	High-----	High.
BfG---------- Berks	C	None--------	---	---	>6.0	---	---	20-40	Soft	Low------	Low------	High.
BmC---------- Bloomfield	A	None--------	---	---	>6.0	---	---	>60	---	Low------	Low------	High.
Bo---------- Bonnie	C/D	Frequent----	Long------	Mar-Jun	0-1.0	Apparent	Mar-Jun	>60	---	High-----	High-----	High.
Br*---------- Brookston	B/D	None--------	---	---	+.5-1.0	Apparent	Dec-May	>60	---	High-----	High-----	Low.
ChF---------- Chetwynd	B	None--------	---	---	>6.0	---	---	>60	---	Moderate	Low------	High.
CnC2, CnC3, CnD2, CnD3---------- Cincinnati	C	None--------	---	---	>4.0	Perched	Jan-Apr	>60	---	High-----	Moderate	High.
CrA---------- Crosby	C	None--------	---	---	1.0-3.0	Apparent	Jan-Apr	>60	---	High-----	High-----	Moderate.
CsB2**: Crosby----------	C	None--------	---	---	1.0-3.0	Apparent	Jan-Apr	>60	---	High-----	High-----	Moderate.
Miami----------	B	None--------	---	---	>6.0	---	---	>60	---	Moderate	Moderate	Moderate.
EsC2---------- Elkinsville	B	Rare--------	---	---	>6.0	---	---	>60	---	High-----	Moderate	High.
Ev*---------- Evansville	B/D	None--------	---	---	+.5-1.0	Apparent	Jan-May	>60	---	High-----	High-----	Low.

See footnotes at end of table.

TABLE 18.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydrologic group	Flooding			High water table			Bedrock		Potential frost action	Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness		Uncoated steel	Concrete
					Ft			In				
FcA---------- Fincastle	C	None--------	---	---	1.0-3.0	Apparent	Jan-Apr	>60	---	High-----	High-----	Moderate.
FoA, FoB2, FxC2**- Fox	B	None--------	---	---	>6.0	---	---	>60	---	Moderate	Low------	Moderate.
Ge---------- Genesee	B	Frequent----	Brief-----	Oct-Jun	>6.0	---	---	>60	---	Moderate	Low------	Low.
GpC, GpD, GpE----- Gilpin	C	None--------	---	---	>6.0	---	---	20-40	Soft	Moderate	Low------	High.
GrC, GrD2--------- Grayford	B	None--------	---	---	>6.0	---	---	>60	---	High-----	High-----	Moderate.
Ha---------- Haymond	B	Frequent----	Brief-----	Jan-May	>6.0	---	---	>60	---	High-----	Low------	Low.
HkF---------- Hickory	C	None--------	---	---	>6.0	---	---	>60	---	Moderate	Moderate	Moderate.
IvA---------- Iva	C	None--------	---	---	1.0-3.0	Apparent	Jan-Apr	>60	---	High-----	High-----	Moderate.
MbD2, MbE--------- Markland	C	None--------	---	---	3.0-6.0	Perched	Mar-Apr	>60	---	Moderate	High-----	Moderate.
MeA, MeB---------- Martinsville	B	None--------	---	---	>6.0	---	---	>60	---	Moderate	Moderate	Moderate.
MnB2, MnC2, MnD2, MnE, MnF, MoC3, MoD3---------- Miami	B	None--------	---	---	>6.0	---	---	>60	---	Moderate	Moderate	Moderate.
Mp*---------- Milford	B/D	None--------	---	---	+.5-2.0	Apparent	Mar-Jun	>60	---	High-----	High-----	Low.
Mu*---------- Montgomery	D	None--------	---	---	+.1-1.0	Apparent	Dec-May	>60	---	Moderate	High-----	Low.
OcA, OcB2--------- Ockley	B	None--------	---	---	>6.0	---	---	>60	---	Moderate	Moderate	Moderate.
PkC2, PkD--------- Parke	B	None--------	---	---	>6.0	---	---	>60	---	High-----	Moderate	High.
Pm*---------- Patton	B/D	None--------	---	---	+.5-2.0	Apparent	Mar-Jun	>60	---	High-----	High-----	Low.

See footnotes at end of table.

TABLE 18.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydrologic group	Flooding			High water table			Bedrock		Potential frost action	Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness		Uncoated steel	Concrete
					Ft			In				
PnB---------- Pekin	C	Rare--------	---	---	2.0-6.0	Apparent	Mar-Apr	>60	---	High-----	Moderate	High.
PpA, PpB2---------- Pike	B	None--------	---	---	>6.0	---	---	>60	---	High-----	Low------	High.
PrA, PrB, PrC, PrD, PrE---------- Princeton	B	None--------	---	---	>6.0	---	---	>60	---	Moderate	Moderate	Moderate.
Ps. Pits												
Rd---------- Reesville	C	None--------	---	---	1.0-2.0	Apparent	Jan-Apr	>60	---	High-----	High-----	Moderate.
Re*---------- Rensselaer	B/D	None--------	---	---	+.5-1.0	Apparent	Dec-May	>60	---	High-----	High-----	Low.
Ro---------- Ross	B	Occasional	Very brief	Nov-Jun	4.0-6.0	Apparent	Feb-Apr	>60	---	Moderate	Low------	Low.
RuB---------- Russell'	B	None--------	---	---	>6.0	---	---	>60	---	High-----	Moderate	Moderate.
Sh---------- Shoals	C	Frequent----	Brief-----	Oct-Jun	1.0-3.0	Apparent	Jan-Apr	>60	---	High-----	High-----	Low.
Sn---------- Sloan	B/D	Frequent----	Brief-----	Nov-Jun	0-1.0	Apparent	Nov-Jun	>60	---	High-----	High-----	Low.
St---------- Stonelick	B	Frequent----	Very brief	Nov-Jun	>6.0	---	---	>60	---	Moderate	Low------	Low.
Ta---------- Taggart	C	None--------	---	---	1.0-3.0	Apparent	Jan-Apr	>60	---	High-----	High-----	High.
VoA---------- Vigo	D	None--------	---	---	0.5-2.5	Apparent	Jan-Apr	>60	---	High-----	High-----	High.
Wa---------- Wakeland	B/D	Frequent----	Brief-----	Jan-May	1.0-3.0	Apparent	Jan-Apr	>60	---	High-----	High-----	Low.
WcG---------- Weikert	C/D	None--------	---	---	>6.0	---	---	10-20	Soft	Moderate	Moderate	Moderate.
WfC---------- Wellston	B	None--------	---	---	>6.0	---	---	>40	Hard	High-----	Moderate	High.
Wr---------- Whitaker	C	None--------	---	---	1.0-3.0	Apparent	Jan-Apr	>60	---	High-----	High-----	Moderate.
Wu---------- Wilbur	C	Frequent----	Brief-----	Oct-Jun	3.0-6.0	Apparent	Mar-Apr	>60	---	High-----	Moderate	Moderate.

See footnote at end of table.

TABLE 18.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydrologic group	Flooding			High water table			Bedrock		Potential frost action	Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness		Uncoated steel	Concrete
					Ft			In				
XeB2---------- Xenia	B	None--------	---	---	2.0-6.0	Apparent	Mar-Apr	>60	---	High------	High------	Moderate.
ZaB, ZaC---------- Zanesville	C	None--------	---	---	2.0-3.0	Perched	Dec-Apr	>40	Hard	---	Moderate	High.
Zp*---------- Zipp	C/D	None--------	---	---	+.5-1.0	Apparent	Dec-May	>60	---	Moderate	High------	Low.

* In the "High water table--Depth" column, a plus sign preceding the range in depth indicates that the water table is above the surface of the soil. The first numeral in the range indicates how high the water rises above the surface. The second numeral indicates the depth below the surface.

** See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 19.--CLASSIFICATION OF THE SOILS

Soil name	Family or higher taxonomic class
Alford	Fine-silty, mixed, mesic Typic Hapludalfs
Armiesburg	Fine-silty, mixed, mesic Fluventic Hapludolls
Ava	Fine-silty, mixed, mesic Typic Fragiudalfs
Banlic	Coarse-silty, mixed, nonacid, mesic Aeric Haplaquepts
Bartle	Fine-silty, mixed, mesic Aeric Fragiaqualfs
*Bedford	Fine-silty, mixed, mesic Typic Fragiudults
Berks	Loamy-skeletal, mixed, mesic Typic Dystrochrepts
Bloomfield	Coarse-loamy, mixed, mesic Psammentic Hapludalfs
Bonnie	Fine-silty, mixed, acid, mesic Typic Fluvaquents
Brookston	Fine-loamy, mixed, mesic Typic Argiaquolls
Chetwynd	Fine-loamy, mixed, mesic Typic Hapludults
Cincinnati	Fine-silty, mixed, mesic Typic Fragiudalfs
Crosby	Fine, mixed, mesic Aeric Ochraqualfs
Elkinsville	Fine-silty, mixed, mesic Ultic Hapludalfs
Evansville	Fine-silty, mixed, nonacid, mesic Typic Haplaquepts
Fincastle	Fine-silty, mixed, mesic Aeric Ochraqualfs
Fox	Fine-loamy over sandy or sandy-skeletal, mixed, mesic Typic Hapludalfs
Genesee	Fine-loamy, mixed, nonacid, mesic Typic Udifluvents
Gilpin	Fine-loamy, mixed, mesic Typic Hapludults
Grayford	Fine-silty, mixed, mesic Typic Hapludalfs
Haymond	Coarse-silty, mixed, nonacid, mesic Typic Udifluvents
Hickory	Fine-loamy, mixed, mesic Typic Hapludalfs
Iva	Fine-silty, mixed, mesic Aeric Ochraqualfs
Markland	Fine, mixed, mesic Typic Hapludalfs
Martinsville	Fine-loamy, mixed, mesic Typic Hapludalfs
Miami	Fine-loamy, mixed, mesic Typic Hapludalfs
Milford	Fine, mixed, mesic Typic Haplaquolls
Montgomery	Fine, mixed, mesic Typic Haplaquolls
Ockley	Fine-loamy, mixed, mesic Typic Hapludalfs
Parke	Fine-silty, mixed, mesic Ultic Hapludalfs
*Patton	Fine-silty, mixed, mesic Typic Haplaquolls
Pekin	Fine-silty, mixed, mesic Aquic Fragiudalfs
Pike	Fine-silty, mixed, mesic Ultic Hapludalfs
Princeton	Fine-loamy, mixed, mesic Typic Hapludalfs
Reesville	Fine-silty, mixed, mesic Aeric Ochraqualfs
Rensselaer	Fine-loamy, mixed, mesic Typic Argiaquolls
Ross	Fine-loamy, mixed, mesic Cumulic Hapludolls
Russell	Fine-silty, mixed, mesic Typic Hapludalfs
Shoals	Fine-loamy, mixed, nonacid, mesic Aeric Fluvaquents
Sloan	Fine-loamy, mixed, mesic Fluvaquentic Haplaquolls
Stonelick	Coarse-loamy, mixed (calcareous), mesic Typic Udifluvents
Taggart	Fine-silty, mixed, mesic Aeric Ochraqualfs
Vigo	Fine-silty, mixed, mesic Typic Glossaqualfs
Wakeland	Coarse-silty, mixed, nonacid, mesic Aeric Fluvaquents
Weikert	Loamy-skeletal, mixed, mesic Lithic Dystrochrepts
Wellston	Fine-silty, mixed, mesic Ultic Hapludalfs
Whitaker	Fine-loamy, mixed, mesic Aeric Ochraqualfs
Wilbur	Coarse-silty, mixed, nonacid, mesic Aquic Udifluvents
Xenia	Fine-silty, mixed, mesic Aquic Hapludalfs
Zanesville	Fine-silty, mixed, mesic Typic Fragiudalfs
Zipp	Fine, mixed, nonacid, mesic Typic Haplaquepts

* The soil is a taxadjunct to the series. See text for a description of those characteristics of the soil that are outside the range of the series.

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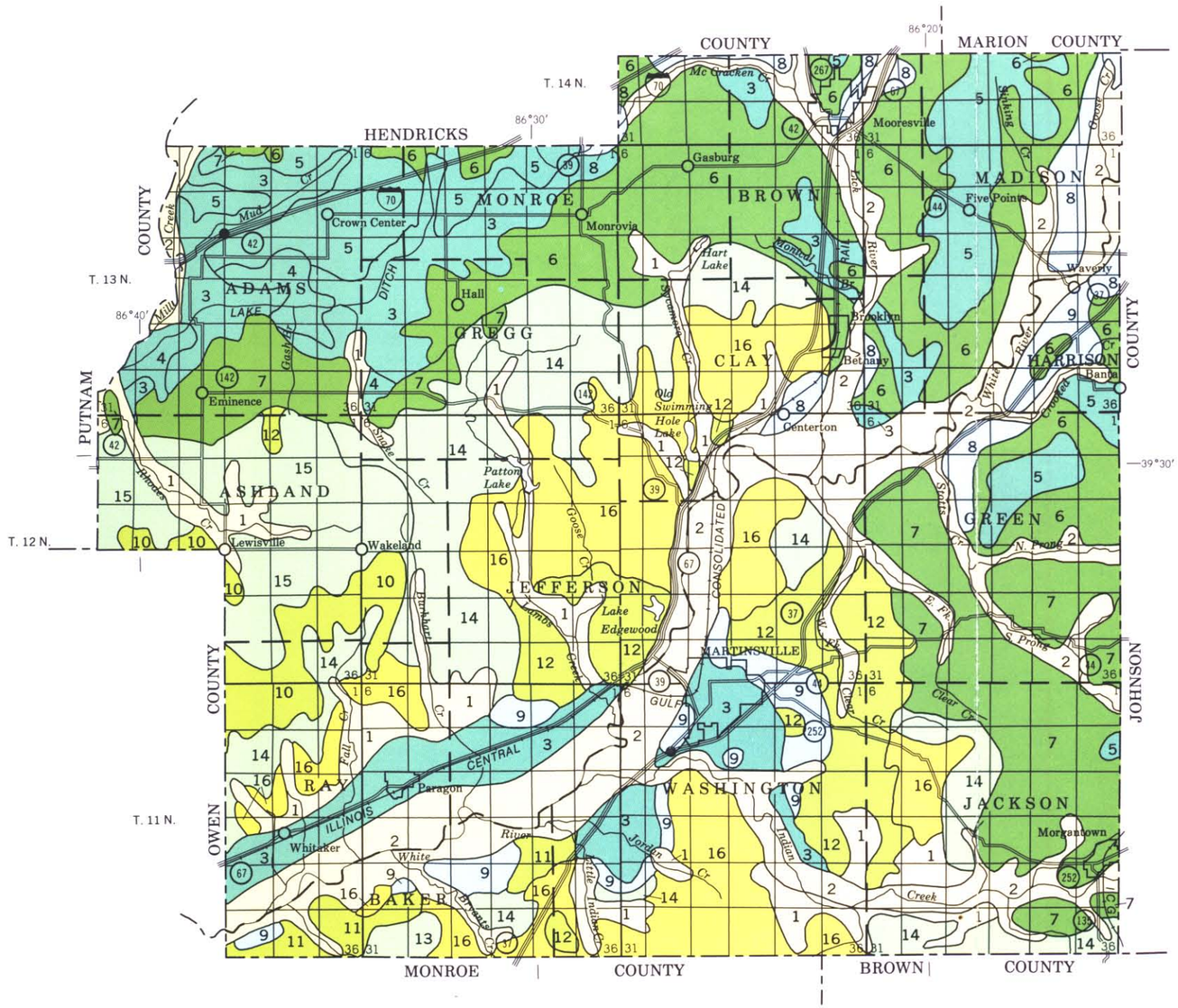

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
PURDUE UNIVERSITY AGRICULTURAL EXPERIMENT STATION
INDIANA DEPARTMENT OF NATURAL RESOURCES,
SOIL AND WATER CONSERVATION COMMITTEE

GENERAL SOIL MAP
MORGAN COUNTY, INDIANA

Scale 1:190,080

1 0 1 2 3 4 Miles
1 0 1 2 3 4 5 6 Kilometers

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SOIL LEGEND

AREAS DOMINATED BY DEEP, NEARLY LEVEL, WELL DRAINED TO SOMEWHAT POORLY DRAINED SOILS ON FLOOD PLAINS AND LOW TERRACES

1 — Wakeland-Banlic-Wilbur: Deep, nearly level, somewhat poorly drained and moderately well drained soils that formed in silty alluvium; on bottom lands and low terraces

2 — Genesee-Shoals: Deep, nearly level, well drained and somewhat poorly drained soils that formed in loamy and silty alluvium; on bottom lands

AREAS DOMINATED BY DEEP, NEARLY LEVEL AND GENTLY SLOPING, VERY POORLY DRAINED TO WELL DRAINED SOILS ON OUTWASH PLAINS, TERRACES, LAKEBEDS, AND UPLANDS

3 — Rensselaer-Whitaker-Martinsville: Deep, nearly level and gently sloping, very poorly drained, somewhat poorly drained, and well drained soils that formed in loamy and silty sediment; on terraces, lakebeds, and outwash plains

4 — Patton-Whitaker: Deep, nearly level, poorly drained and somewhat poorly drained soils that formed in silty and loamy sediment; on glacial lakebeds and outwash plains

5 — Crosby-Brookston: Deep, nearly level and gently sloping, somewhat poorly drained and very poorly drained soils that formed in loess and the underlying glacial till or in glacial till; on uplands

AREAS DOMINATED BY DEEP, NEARLY LEVEL TO VERY STEEP, WELL DRAINED TO SOMEWHAT POORLY DRAINED SOILS ON UPLANDS

6 — Miami-Crosby: Deep, nearly level to very steep, well drained and somewhat poorly drained soils that formed in loess and the underlying glacial till; on uplands

7 — Miami-Fincastle-Xenia: Deep, nearly level to very steep, well drained to somewhat poorly drained soils that formed in loess and the underlying glacial till; on uplands

AREAS DOMINATED BY DEEP AND MODERATELY DEEP OVER SAND AND GRAVEL, NEARLY LEVEL TO MODERATELY STEEP, WELL DRAINED SOILS ON OUTWASH PLAINS, TERRACES, AND UPLANDS

8 — Fox-Ockley: Nearly level to strongly sloping, well drained soils that are moderately deep and deep over sand and gravel and that formed in loamy outwash; on terraces and outwash plains

9 — Princeton: Deep, nearly level to moderately steep, well drained soils that formed in windblown silt and sand; on uplands

AREAS DOMINATED BY DEEP, NEARLY LEVEL TO VERY STEEP, WELL DRAINED SOILS ON UPLANDS, OUTWASH PLAINS, TERRACES, AND MORAINES

10 — Alford-Grayford: Deep, nearly level to strongly sloping, well drained soils that formed in loess or in loess, loamy glacial till, and limestone residuum; on uplands

11 — Alford-Hickory: Deep, nearly level to very steep, well drained soils that formed in loess or in loamy glacial till; on uplands

12 — Parke-Chetwynd-Pike: Deep, nearly level to very steep, well drained soils that formed in loess and the underlying loamy glacial drift or in outwash sediment; on moraines, outwash plains, and terraces

AREAS DOMINATED BY DEEP, NEARLY LEVEL TO VERY STEEP, WELL DRAINED TO POORLY DRAINED SOILS ON UPLANDS

13 — Hickory-Bedford: Deep, gently sloping to very steep, well drained and moderately well drained soils that formed in glacial till or in loess and residuum from limestone; on uplands

14 — Hickory-Cincinnati-Ava: Deep, gently sloping to very steep, well drained and moderately well drained soils that formed in loamy glacial till or in loess and the underlying glacial till; on uplands

15 — Vigo-Ava-Cincinnati: Deep, nearly level to strongly sloping, well drained to poorly drained soils that formed in loess and the underlying glacial till; on uplands

AREAS DOMINATED BY MODERATELY DEEP AND DEEP, GENTLY SLOPING TO VERY STEEP, WELL DRAINED SOILS ON UPLANDS

16 — Berks-Gilpin-Zanesville: Moderately deep and deep, gently sloping to very steep, well drained soils that formed in residuum of sandstone and shale or in loess and the underlying residuum of sandstone; on uplands

Compiled 1980

SECTIONALIZED TOWNSHIP

6	5	4	3	2	1
7	8	9	10	11	12
18	17	16	15	14	13
19	20	21	22	23	24
30	29	28	27	26	25
31	32	33	34	35	36

Each area outlined on this map consists of more than one kind of soil. The map is thus meant for general planning rather than a basis for decisions on the use of specific tracts.

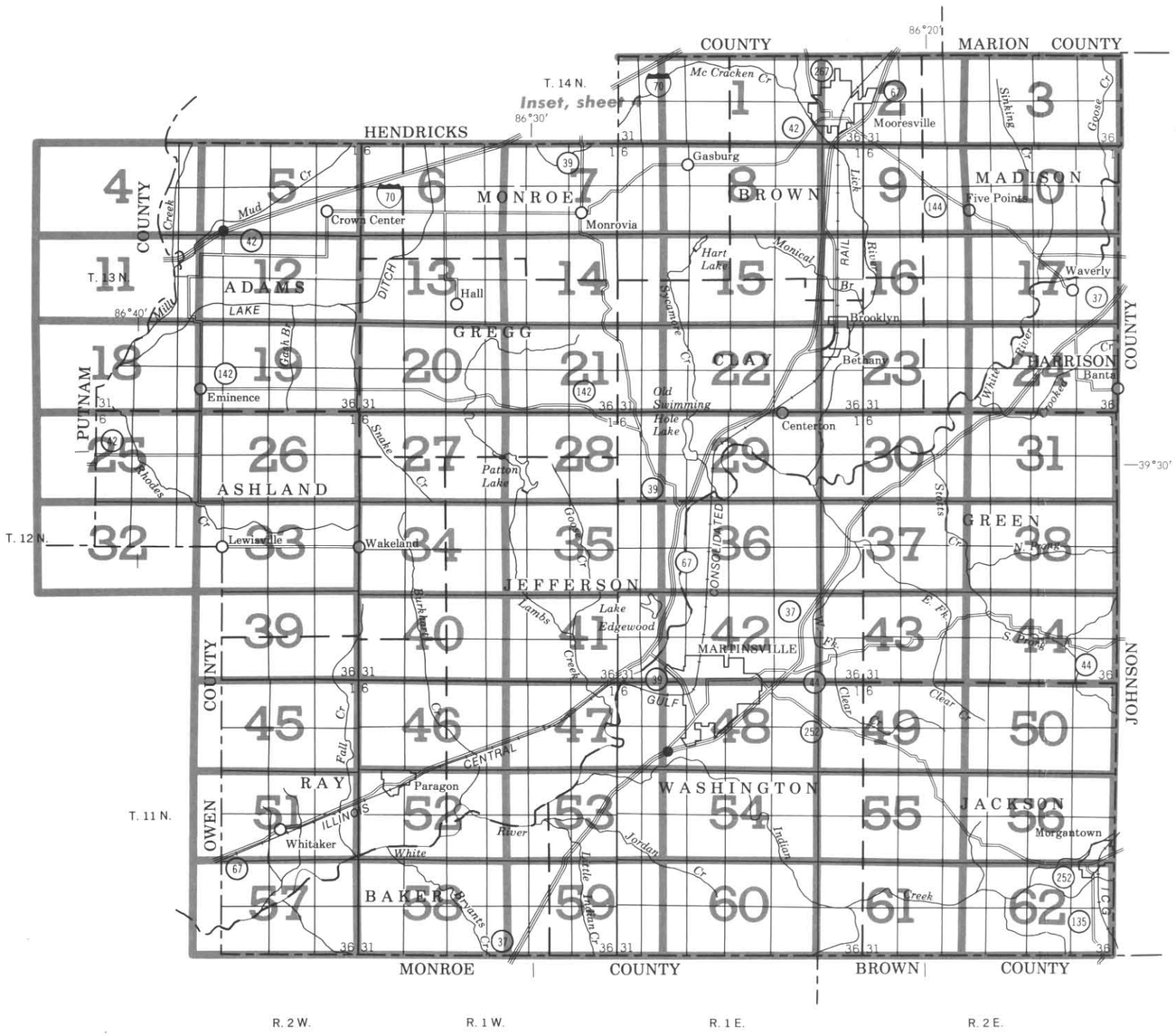
INDEX TO MAP SHEETS
MORGAN COUNTY, INDIANA

Scale 1:190,080

1 0 1 2 3 4 Miles

1 0 1 2 3 4 5 6 Kilometers

N



SECTIONALIZED TOWNSHIP

6	5	4	3	2	1
7	8	9	10	11	12
18	17	16	15	14	13
19	20	21	22	23	24
30	29	28	27	26	25
31	32	33	34	35	36

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

MORGAN COUNTY, INDIANA

PURDUE UNIVERSITY AGRICULTURAL EXPERIMENT STATION
INDIANA DEPARTMENT OF NATURAL RESOURCES
SOIL AND WATER CONSERVATION COMMITTEE

SOIL LEGEND

Map symbols consist of a combination of letters or of letters and numbers. The first capital letter is the initial one of the map unit name. The lowercase letter that follows separates map units having names that begin with the same letter, except that it does not separate slopping or eroded phases. The second capital letter indicates the class of slope. Symbols without a slope letter are for nearly level soils or miscellaneous areas. A final number of 2 indicates that the soil is eroded and 3 that it is severely eroded.

SYMBOL	NAME	SYMBOL	NAME
AfA	Alford silt loam, 0 to 2 percent slopes	MnC2	Miami silt loam, 6 to 12 percent slopes, eroded
AfB	Alford silt loam, 2 to 6 percent slopes	MnD2	Miami silt loam, 12 to 18 percent slopes, eroded
AfC2	Alford silt loam, 6 to 12 percent slopes, eroded	MnE	Miami silt loam, 18 to 25 percent slopes
Ar	Armiesburg silty clay loam	MnF	Miami loam, 25 to 50 percent slopes
AvB	Ava silt loam, 2 to 6 percent slopes	MoC3	Miami clay loam, 6 to 12 percent slopes, severely eroded
Ba	Banlic silt loam	MoD3	Miami clay loam, 12 to 18 percent slopes, severely eroded
Bd	Bartle silt loam	Mp	Milford silty clay loam
BeB	Bedford silt loam, 2 to 6 percent slopes	Mu	Montgomery silty clay loam
BeC2	Bedford silt loam, 6 to 12 percent slopes, eroded	OcA	Ockley loam, 0 to 2 percent slopes
BfG	Berks channery silt loam, 35 to 80 percent slopes	OcB2	Ockley loam, 2 to 6 percent slopes, eroded
BmC	Bloomfield loamy fine sand, 6 to 12 percent slopes	PkC2	Parke silt loam, 6 to 12 percent slopes, eroded
Bo	Bonnie silt loam	PkD	Parke silt loam, 12 to 18 percent slopes
Br	Brookston clay loam	Pm	Patton silty clay loam
ChF	Chetwynd loam, 18 to 80 percent slopes	PnB	Pekin silt loam, 2 to 6 percent slopes
CnC2	Cincinnati silt loam, 6 to 12 percent slopes, eroded	PoA	Pike silt loam, 0 to 2 percent slopes
CnC3	Cincinnati silt loam, 6 to 12 percent slopes, severely eroded	PoB2	Pike silt loam, 2 to 6 percent slopes, eroded
CnD2	Cincinnati silt loam, 12 to 18 percent slopes, eroded	PrA	Princeton fine sandy loam, 0 to 2 percent slopes
CnD3	Cincinnati silt loam, 12 to 18 percent slopes, severely eroded	PrB	Princeton fine sandy loam, 2 to 6 percent slopes
CrA	Crosby silt loam, 0 to 2 percent slopes	PrC	Princeton fine sandy loam, 6 to 12 percent slopes
CsB2	Crosby-Miami silt loams, 2 to 4 percent slopes, eroded	PrD	Princeton fine sandy loam, 12 to 18 percent slopes
EsC2	Elkinsville silt loam, 6 to 12 percent slopes, eroded	PrE	Princeton fine sandy loam, 18 to 25 percent slopes
Ev	Evansville silty clay loam	Ps	Pits
FcA	Fincastle silt loam, 0 to 3 percent slopes	Rd	Reesville silt loam
FoA	Fox loam, 0 to 2 percent slopes	Re	Rensselaer clay loam
FoB2	Fox loam, 2 to 6 percent slopes, eroded	Ro	Ross loam
FxC2	Fox complex, 6 to 15 percent slopes, eroded	RuB	Russell silt loam, 2 to 6 percent slopes
Ge	Genesee silt loam	Sh	Shoals silt loam
GpC	Gilpin silt loam, 6 to 12 percent slopes	Sn	Sloan silty clay loam
GpD	Gilpin silt loam, 12 to 18 percent slopes	St	Stonelick sandy loam
GpE	Gilpin silt loam, 18 to 25 percent slopes	Ta	Taggart silt loam
GrC	Grayford silt loam, 6 to 12 percent slopes	VoA	Vigo silt loam, 0 to 2 percent slopes
GrD2	Grayford silt loam, 12 to 18 percent slopes, eroded	Wa	Wakeland silt loam
Ha	Haymond silt loam	WcG	Weikert channery silt loam, 40 to 80 percent slopes
HkF	Hickory loam, 18 to 50 percent slopes	WfC	Wellston silt loam, 6 to 12 percent slopes
IvA	Iva silt loam, 0 to 3 percent slopes	Wr	Whitaker loam
MbD2	Markland silt loam, 12 to 18 percent slopes, eroded	Wu	Wilbur silt loam
MbE	Markland silt loam, 18 to 25 percent slopes	XeB2	Xenia silt loam, 2 to 7 percent slopes, eroded
MeA	Martinsville loam, 0 to 2 percent slopes	ZaB	Zanesville silt loam, 2 to 6 percent slopes
MeB	Martinsville loam, 2 to 6 percent slopes	ZaC	Zanesville silt loam, 6 to 12 percent slopes
MnB2	Miami silt loam, 2 to 6 percent slopes, eroded	Zo	Zipp silty clay loam

CONVENTIONAL AND SPECIAL SYMBOLS LEGEND

CULTURAL FEATURES

BOUNDARIES

- National, state or province
- County or parish
- Minor civil division
- Reservation (national forest or park, state forest or park, and large airport)
- Land grant
- Limit of soil survey (label)
- Field sheet matchline & neatline

AD HOC BOUNDARY (label)

- Small airport, airfield, park, oilfield, cemetery, or flood pool

STATE COORDINATE TICK

LAND DIVISION CORNERS (sections and land grants)

ROADS

- Divided (median shown if scale permits)
- Other roads
- Trail

ROAD EMBLEMS & DESIGNATIONS

- Interstate (79)
- Federal (41)
- State (52)
- County, farm or ranch (378)

RAILROAD

POWER TRANSMISSION LINE (normally not shown)

PIPE LINE (normally not shown)

FENCE (normally not shown)

LEVEES

- Without road
- With road
- With railroad

DAMS

- Large (to scale)
- Medium or small

PITS

- Gravel pit
- Mine or quarry

MISCELLANEOUS CULTURAL FEATURES

- Farmstead, house (omit in urban areas)
- Church
- School
- Indian mound (label) — Indian Mound
- Located object (label) — Tower
- Tank (label) — GAS
- Wells, oil or gas
- Windmill
- Kitchen midden

WATER FEATURES

DRAINAGE

- Perennial, double line
- Perennial, single line
- Intermittent
- Drainage end
- Canals or ditches
  - Double-line (label) — CANAL
  - Drainage and/or irrigation

LAKES, PONDS AND RESERVOIRS

- Perennial — water
- Intermittent — int

MISCELLANEOUS WATER FEATURES

- Marsh or swamp
- Spring
- Well, artesian
- Well, irrigation
- Wet spot

SPECIAL SYMBOLS FOR SOIL SURVEY

SOIL DELINEATIONS AND SYMBOLS — Ba, XeB2

ESCARPMENTS

- Bedrock (points down slope)
- Other than bedrock (points down slope)

SHORT STEEP SLOPE

GULLY

DEPRESSION OR SINK

SOIL SAMPLE SITE (normally not shown)

MISCELLANEOUS

- Blowout
- Clay spot
- Gravelly spot
- Gumbo, slick or scabby spot (sodic)
- Dumps and other similar non soil areas
- Prominent hill or peak
- Rock outcrop (includes sandstone and shale)
- Saline spot
- Sandy spot
- Severely eroded spot
- Slide or slip (tips point upslope)
- Stony spot, very stony spot
- Borrow pit up to 10 acres in size

MORGAN COUNTY, INDIANA NO. 1

This map is compiled on 1974 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

MORGAN COUNTY, INDIANA — SHEET NUMBER 2

2

N

1 Mile

5 000 Feet

0 0

¼ 1 000

½ 2 000

¾ 3 000

1 4 000

5 000

R. 1 E. | R. 2 E.

HENDRICKS COUNTY

MARION COUNTY

715 000 FEET

775 000 FEET

770 000 FEET

700 000 FEET

T. 14 N.

MOORESVILLE

BROWN

MADISON

25

30

29

28

36

31

32

33

Silon Creek

East Fork White Lick Creek

(Joins sheet 1)

(Joins sheet 3)

(Joins sheet 9)

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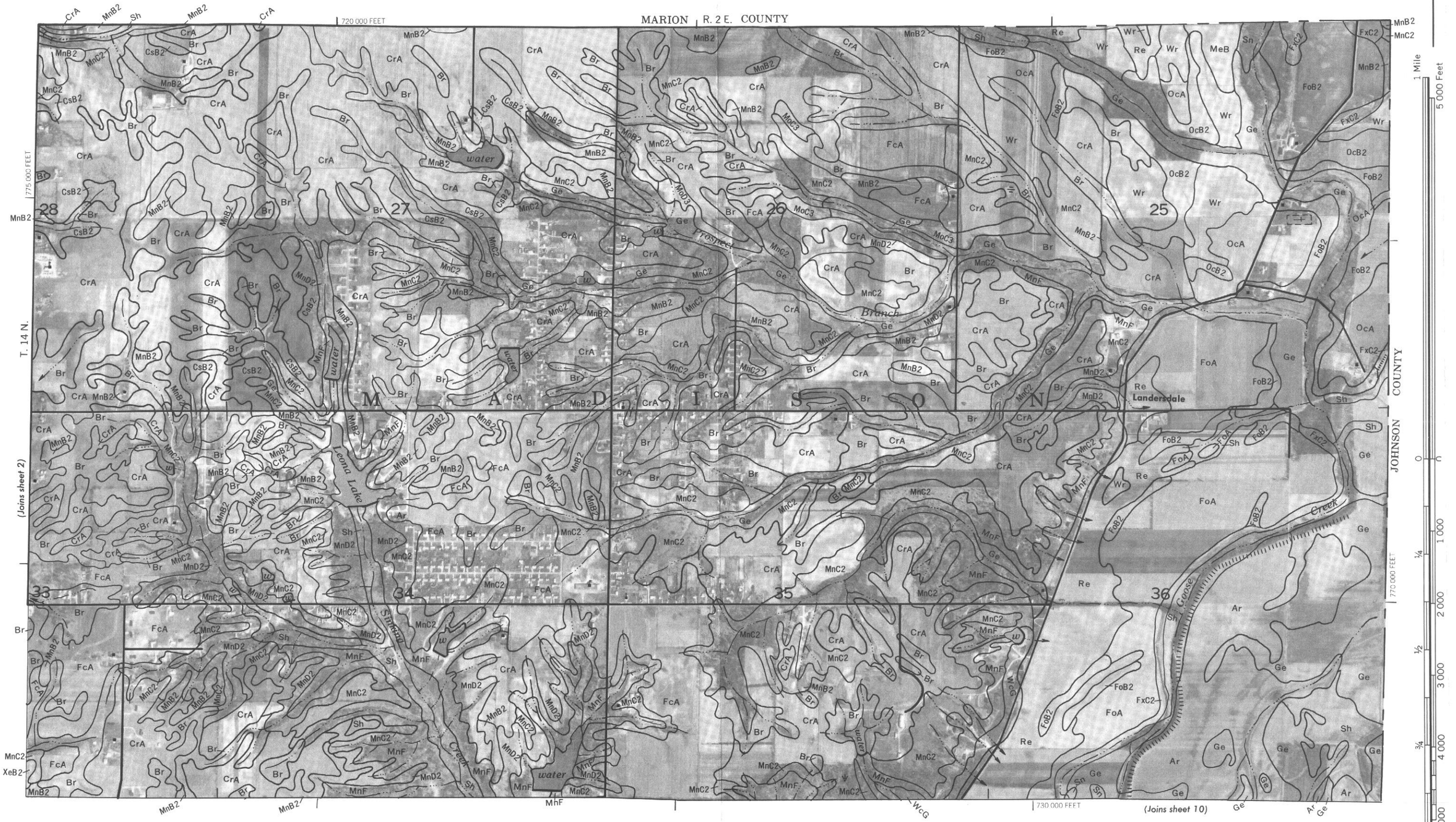
MORGAN COUNTY, INDIANA NO. 2



MORGAN COUNTY, INDIANA NO. 3

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Coordinate grid ticks and land division corners, if shown, are approximately positioned.

4

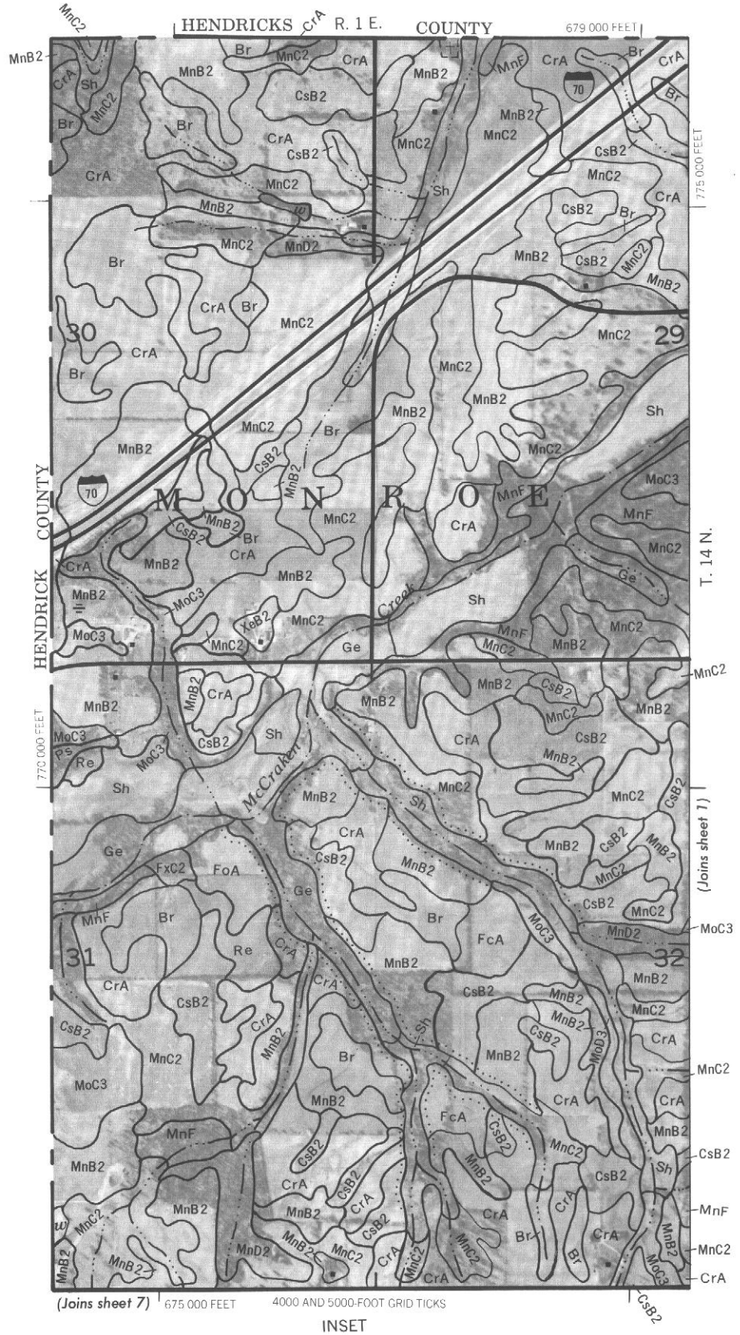
N

1 Mile

5 000 Feet

0 0 1/4 1/2 3/4 1

1 000 2 000 3 000 4 000 5 000



INSET

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MORGAN COUNTY, INDIANA NO. 4

MORGAN COUNTY, INDIANA NO. 5

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625 000 FEET

765 000 FEET

HENDRICKS COUNTY

R. 2 W.

T. 13 N.

(Joins sheet 4)

(Joins sheet 6)

(Joins sheet 12)

640 000 FEET

735 000 FEET

Crown Center

Mud Creek

5

N

1 Mile

5 000 Feet

0 0

¼ 1 000

½ 2 000

¾ 3 000

1 4 000

5 000

6

N

1 Mile

5 000 Feet

HENDRICKS COUNTY

R. 1 W.

660 000 FEET

765 000 FEET

T. 13 N.

ADAMS

MORGAN

6 5 4 3 8 9 10

(Joins sheet 5)

(Joins sheet 7)

(Joins sheet 13)

645 000 FEET

735 000 FEET

0 1 000 2 000 3 000 4 000 5 000

¼ ½ ¾ 1

Br CsB2 CrA MnC2 MnB2 Re Wr MeB FxC2 BmC MnC3 Mp

water

70 42

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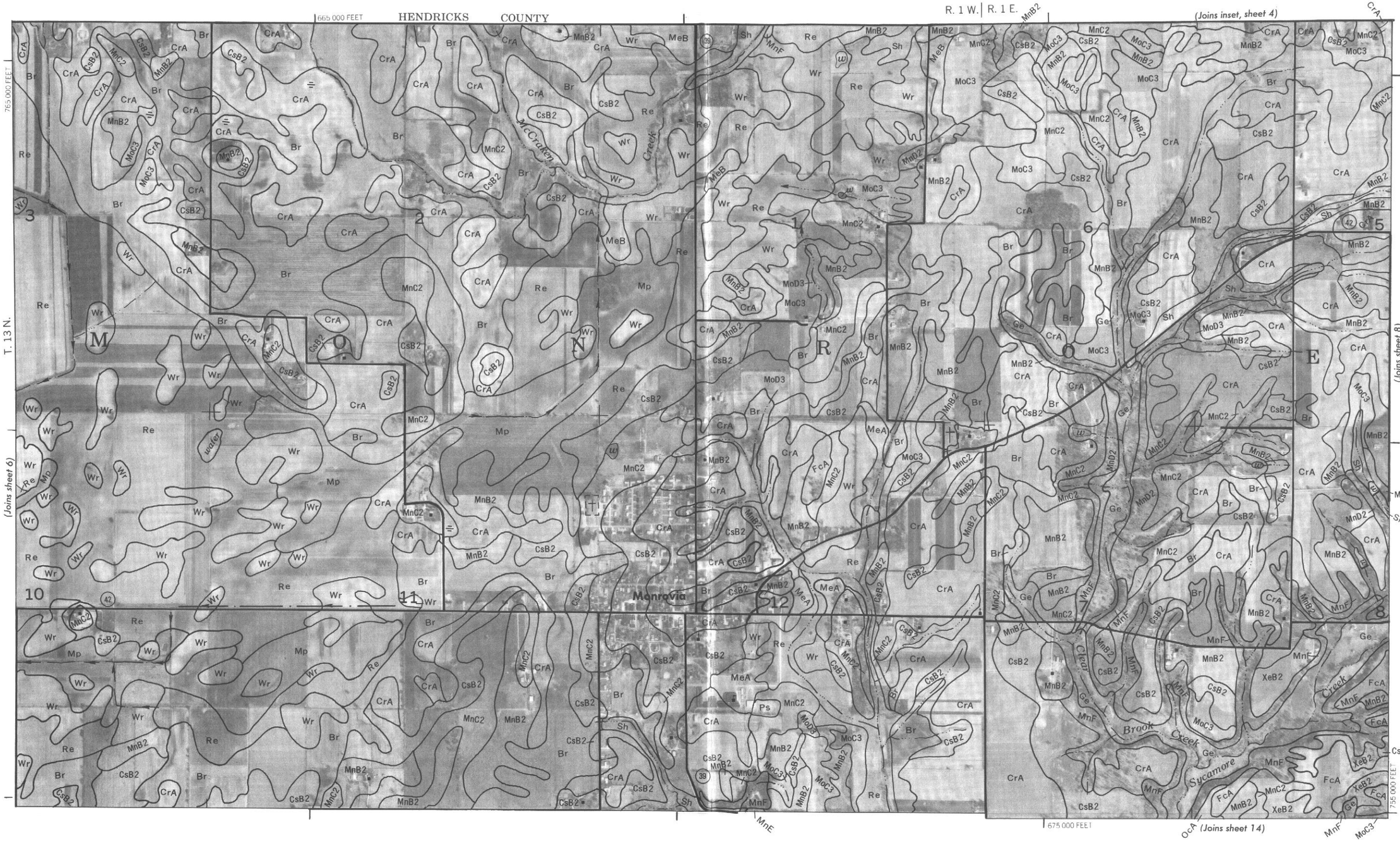
MORGAN COUNTY, INDIANA NO. 6



MORGAN COUNTY, INDIANA NO. 7
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Coordinate grid ticks and land division corners, if shown, are approximately positioned.

MORGAN COUNTY, NDIANA — SHEET NUMBER 8

8

N

1 Mile

5 000 Feet

R. 1 E.

T. 13 N.

695 000 FEET

765 000 FEET

755 000 FEET

680 000 FEET

(Joins sheet 1)

(Joins sheet 7)

(Joins sheet 9)

(Joins sheet 15)

Gasburg

Sycamore

Mauricet

Branch

Mann Lake

MORGAN COUNTY, INDIANA NO. 8

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MORGAN COUNTY, INDIANA NO. 9

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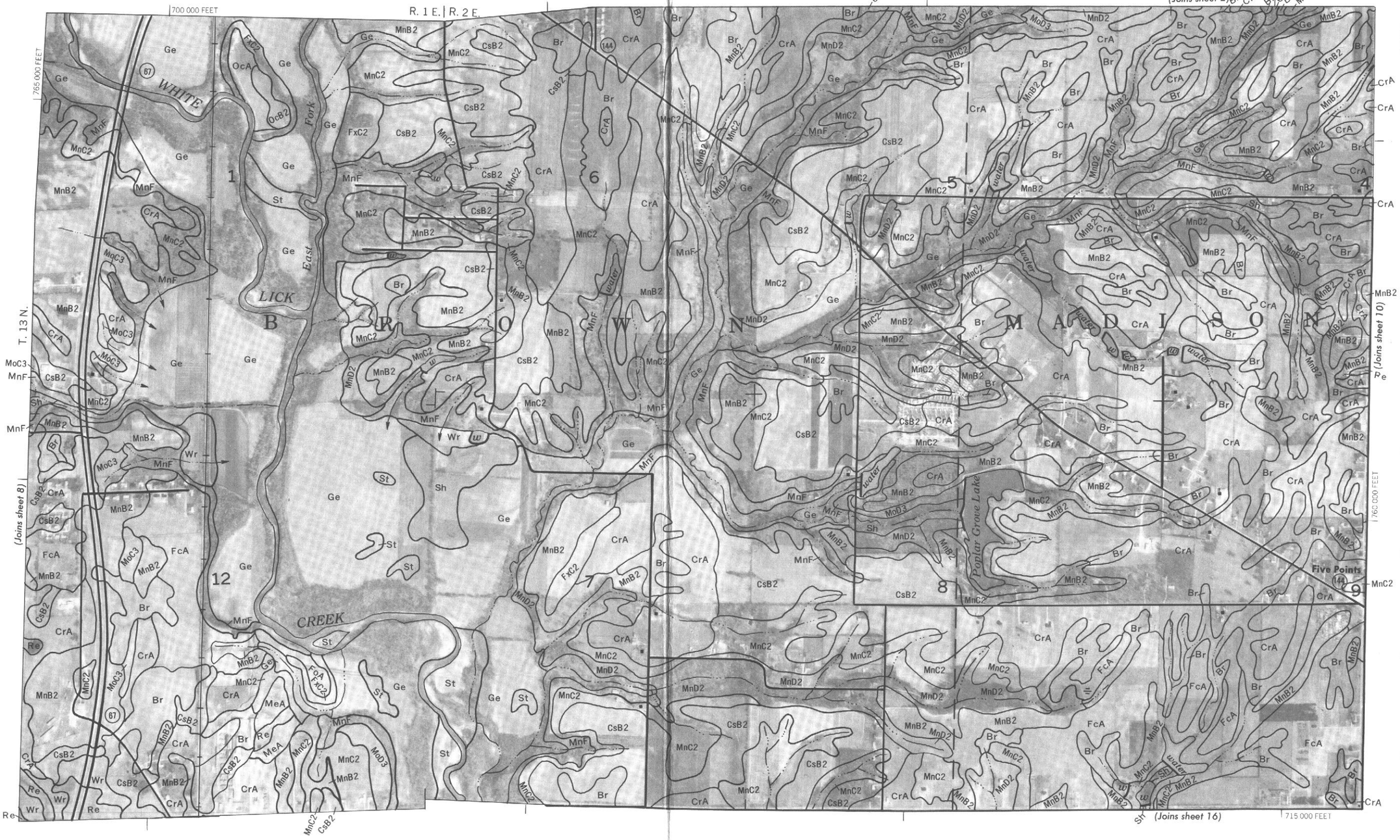

MORGAN COUNTY, INDIANA — SHEET NUMBER 10

10

N

1 Mile

5 000 Feet

R. 2 E.

730 000 FEET

765 000 FEET

760 000 FEET

720 000 FEET

T. 13 N.

(Joins sheet 3)

(Joins sheet 9)

(Joins sheet 17)

Five Points

Sinking Creek

WHITE RIVER

Creek

Bluff

JOHNSON COUNTY

HARRISON

MORGAN COUNTY, INDIANA NO. 10

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MORGAN COUNTY, INDIANA NO. 11

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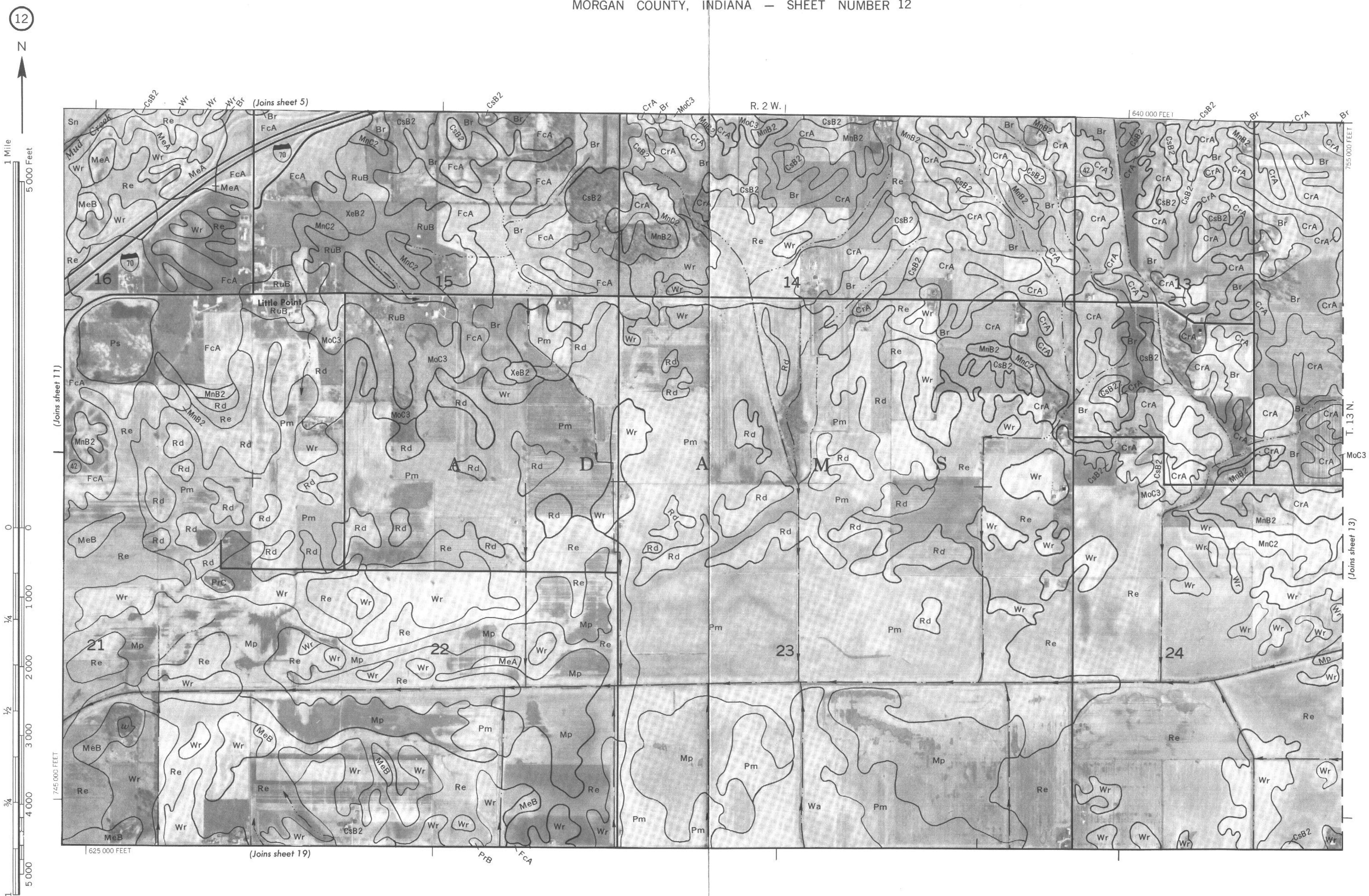

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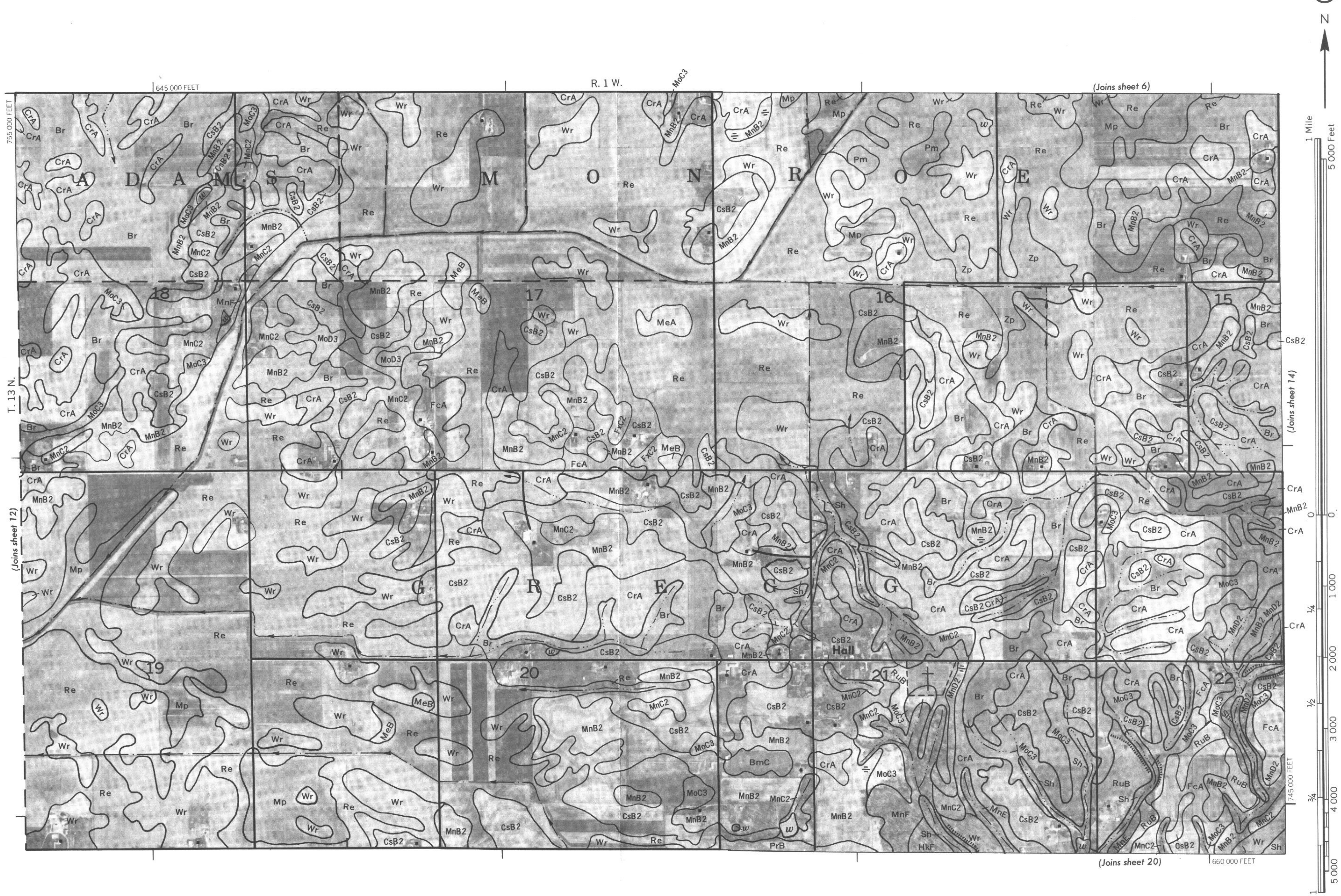
MORGAN COUNTY, INDIANA NO. 12



MORGAN COUNTY, INDIANA NO. 13

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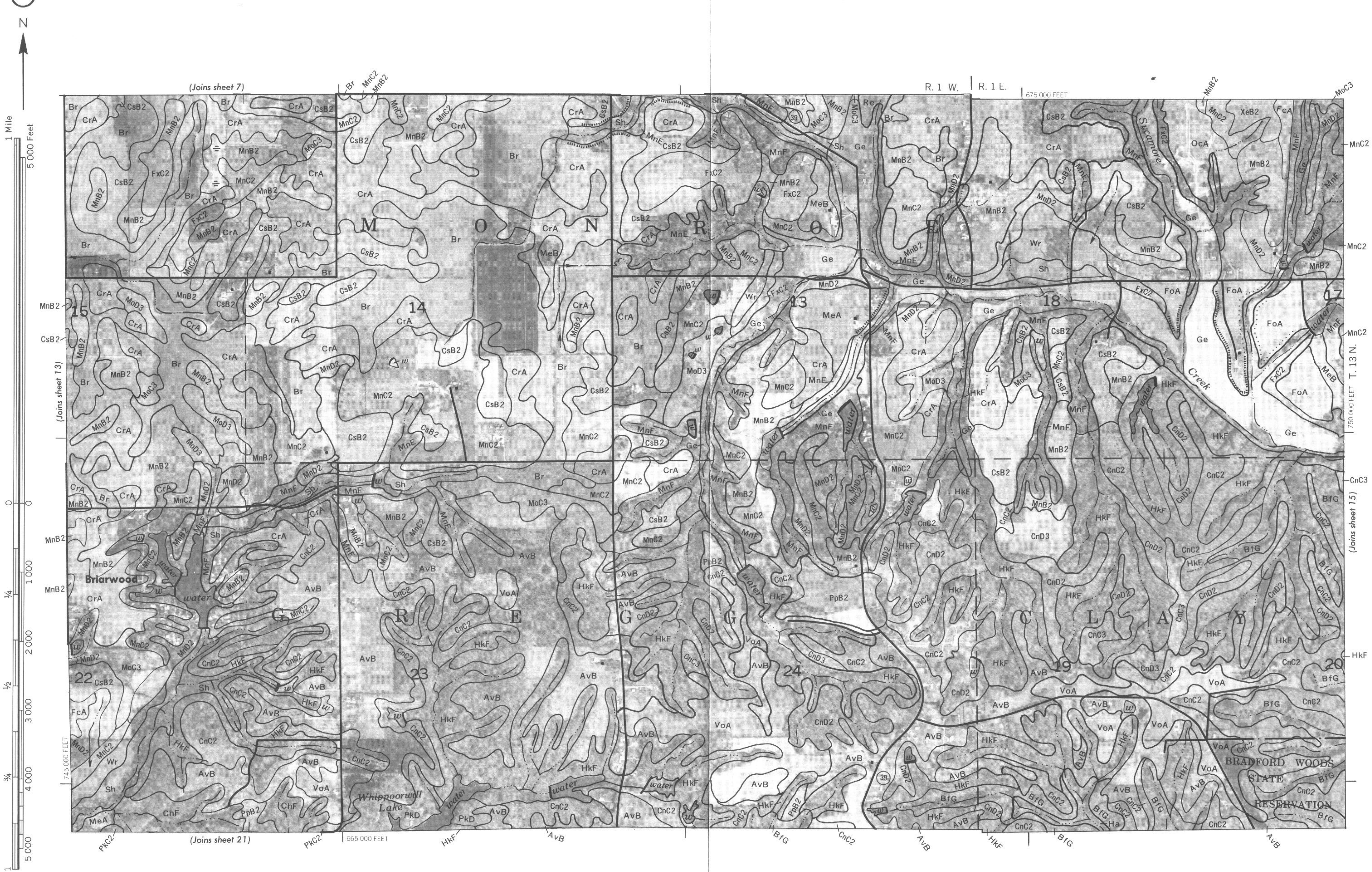
MORGAN COUNTY, INDIANA — SHEET NUMBER 14



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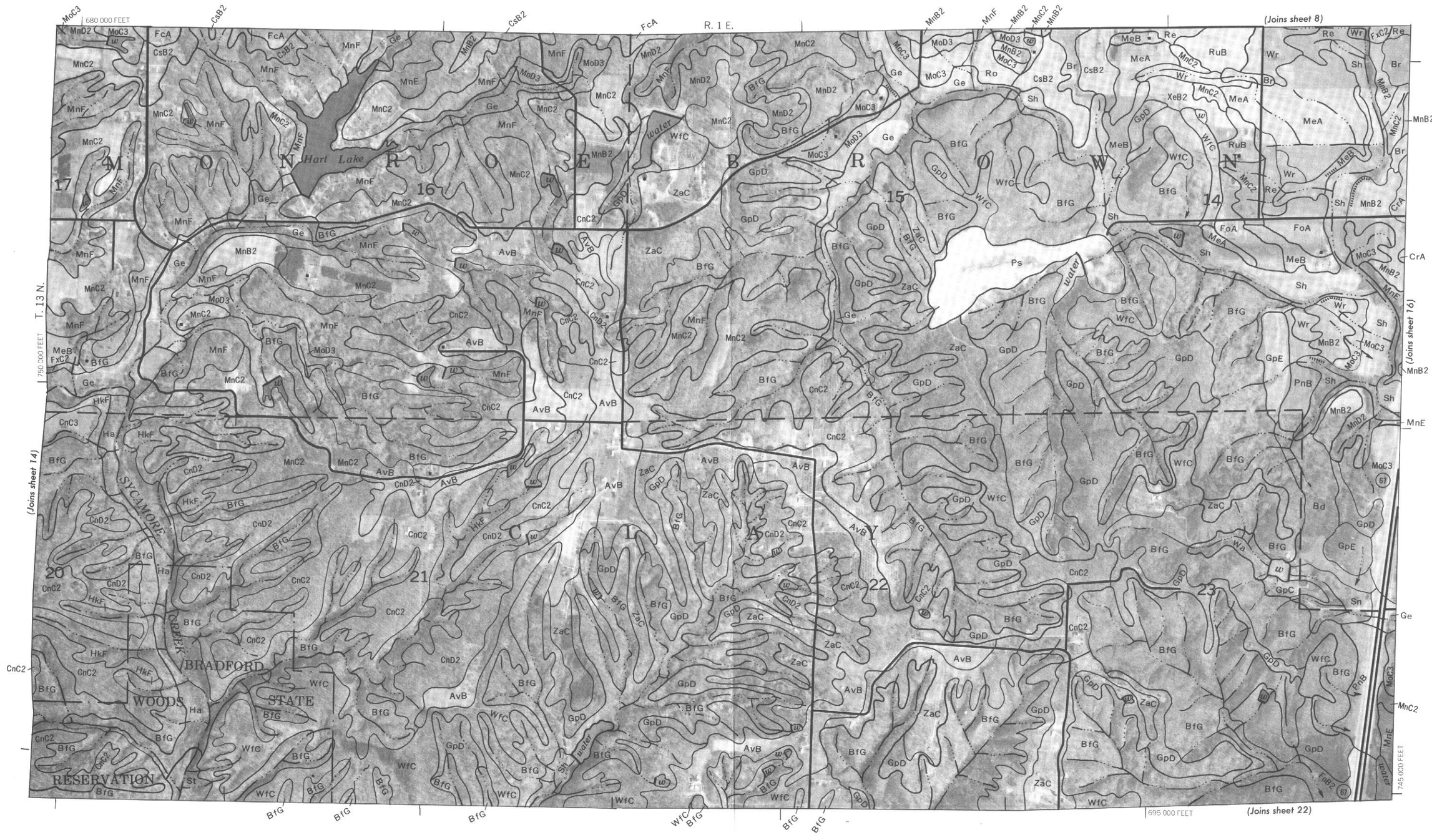

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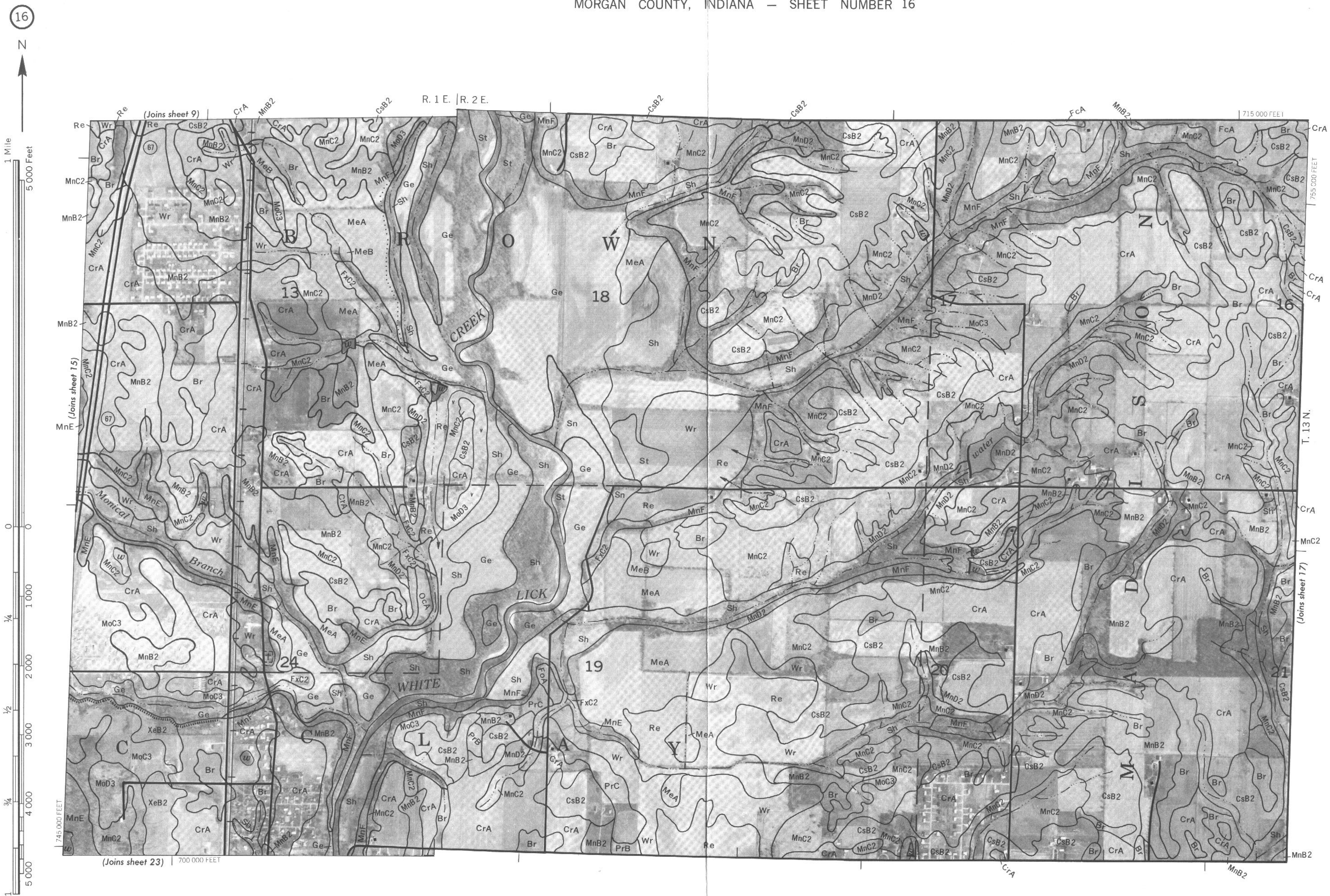

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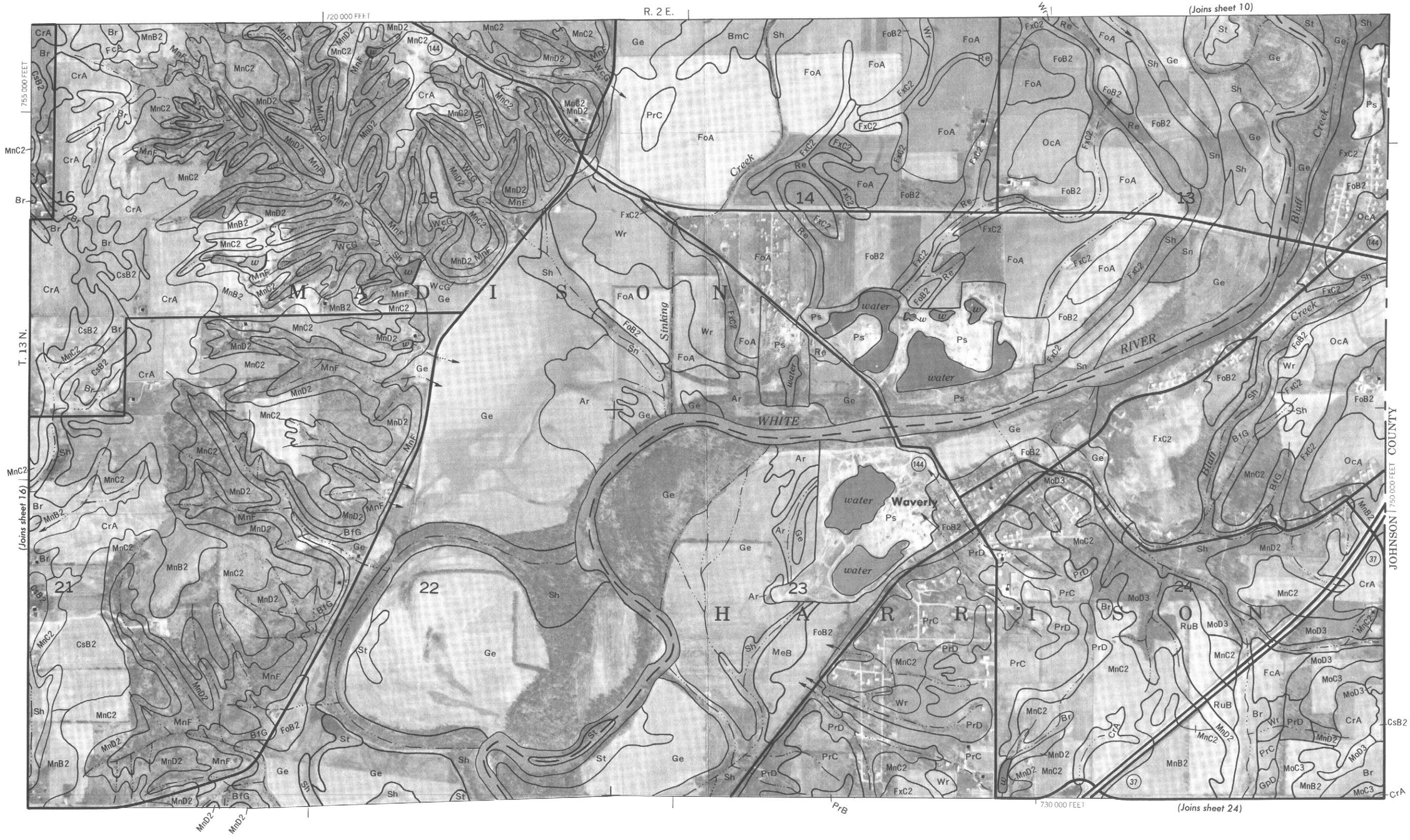

MORGAN COUNTY, INDIANA NO. 17

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18

N

1 Mile

5 000 Feet

0 1 000 2 000 3 000 4 000 5 000

¼ ½ ¾ 1

R. 2 W.

620 000 FEET

(Joins sheet 11)

735 000 FEET

610 000 FEET

(Joins sheet 25)

(Joins sheet 19)

740 000 FEET

T. 13 N.

Sh Ev Re MeB Wr PrC PrB FcA Wa MeA MnC2 MnD2 MnF MoC3 XeB2 Br Ge Zp

Mill Creek

Rhodes Creek

PUTNAM COUNTY

29 28 30 31 32 33

Eminence

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MORGAN COUNTY, INDIANA NO. 18

MORGAN COUNTY, INDIANA NO. 19

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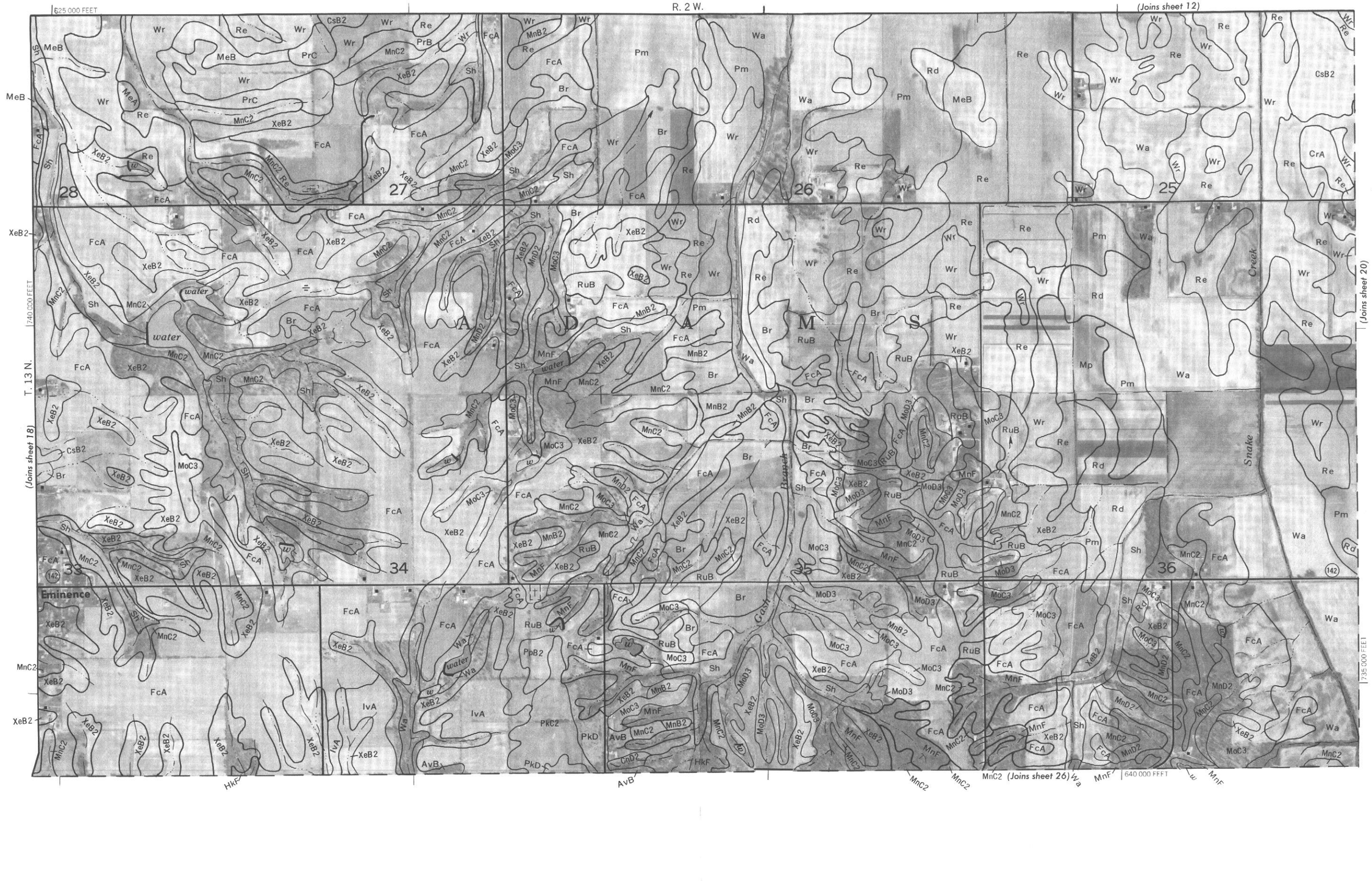

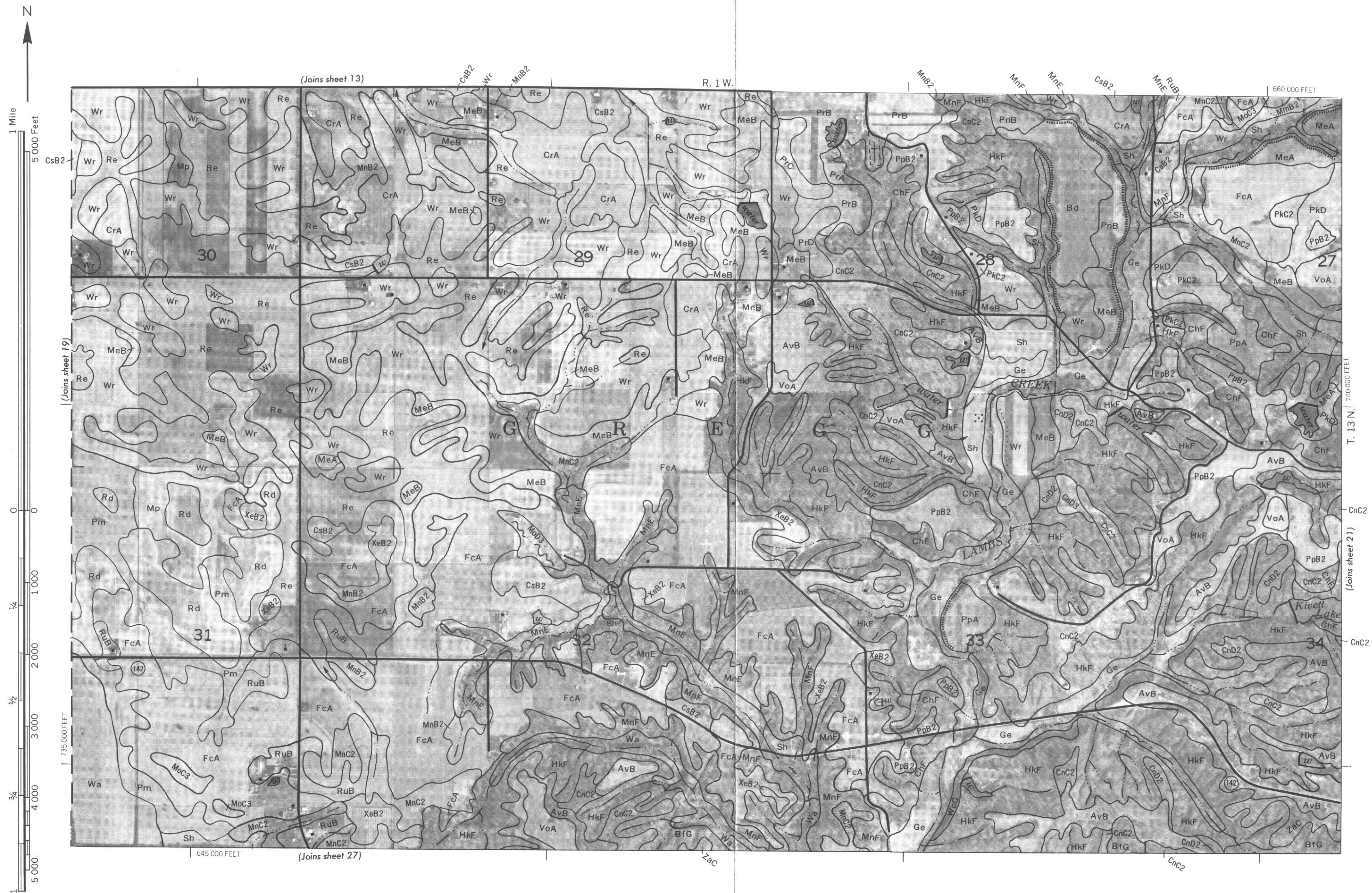

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MORGAN COUNTY, INDIANA NO. 20

MORGAN COUNTY, INDIANA NO. 21
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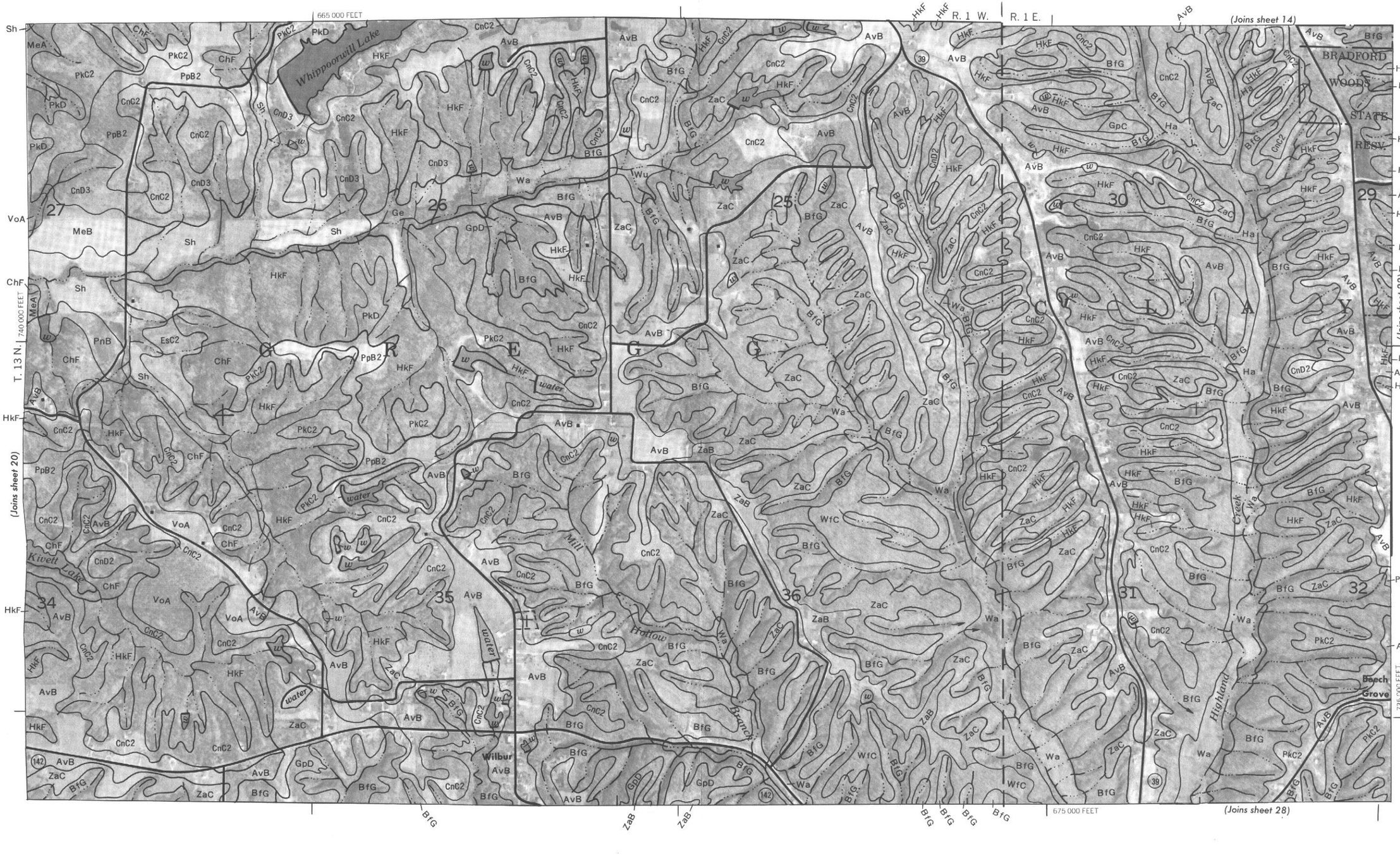

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MORGAN COUNTY, INDIANA NO. 22

MORGAN COUNTY, INDIANA NO. 23

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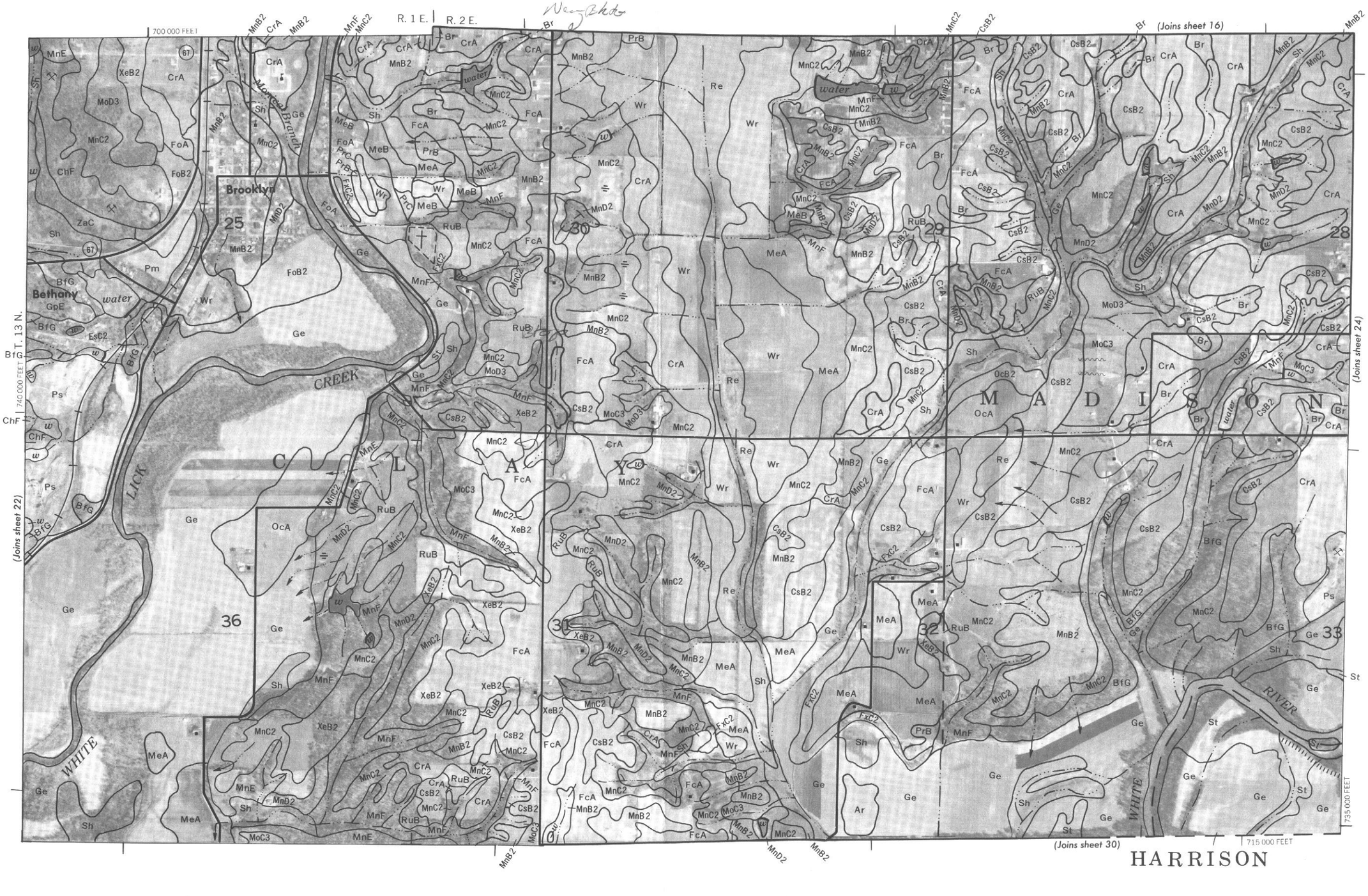

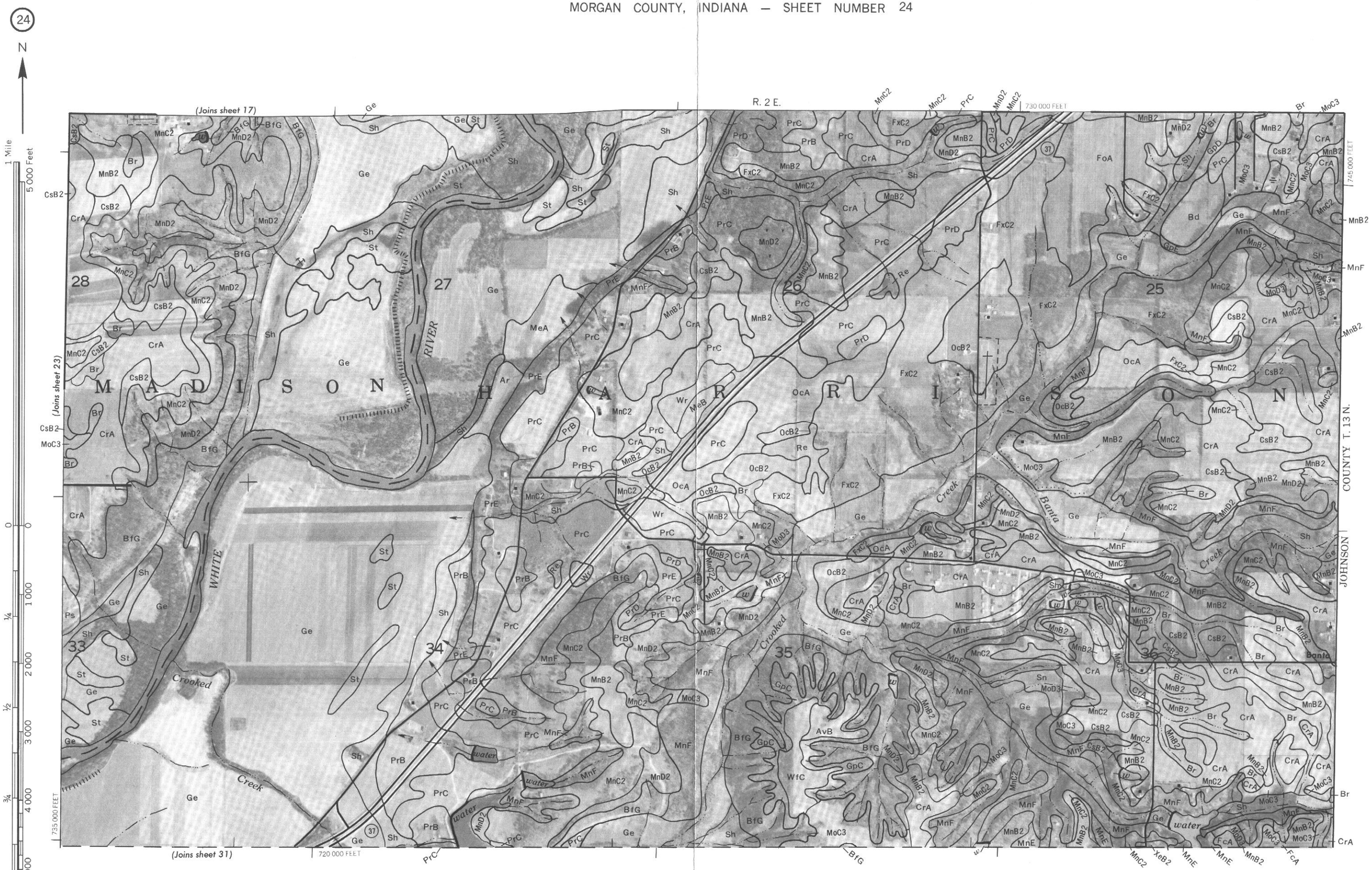

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MORGAN COUNTY, INDIANA NO. 24

MORGAN COUNTY, INDIANA NO. 25

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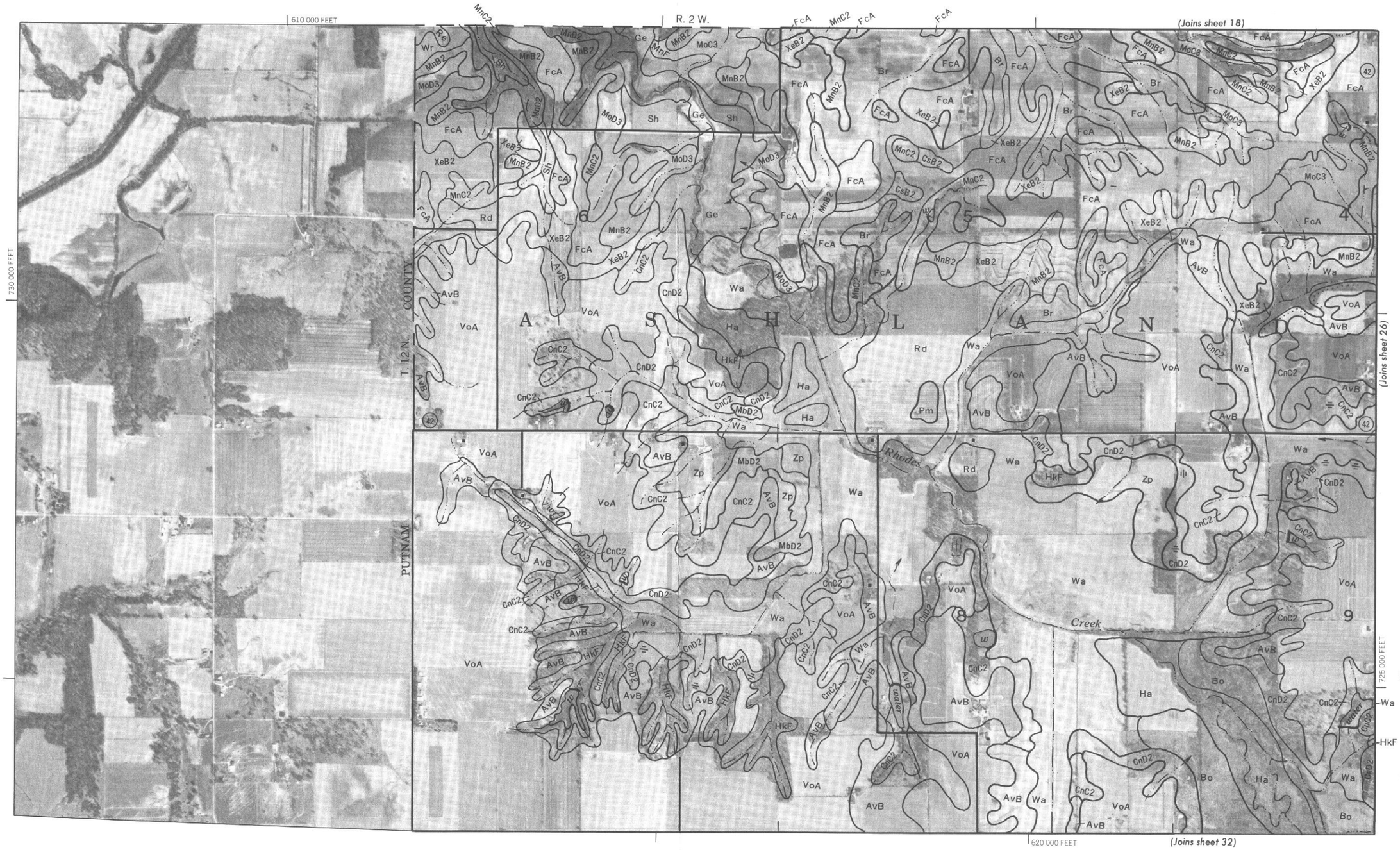
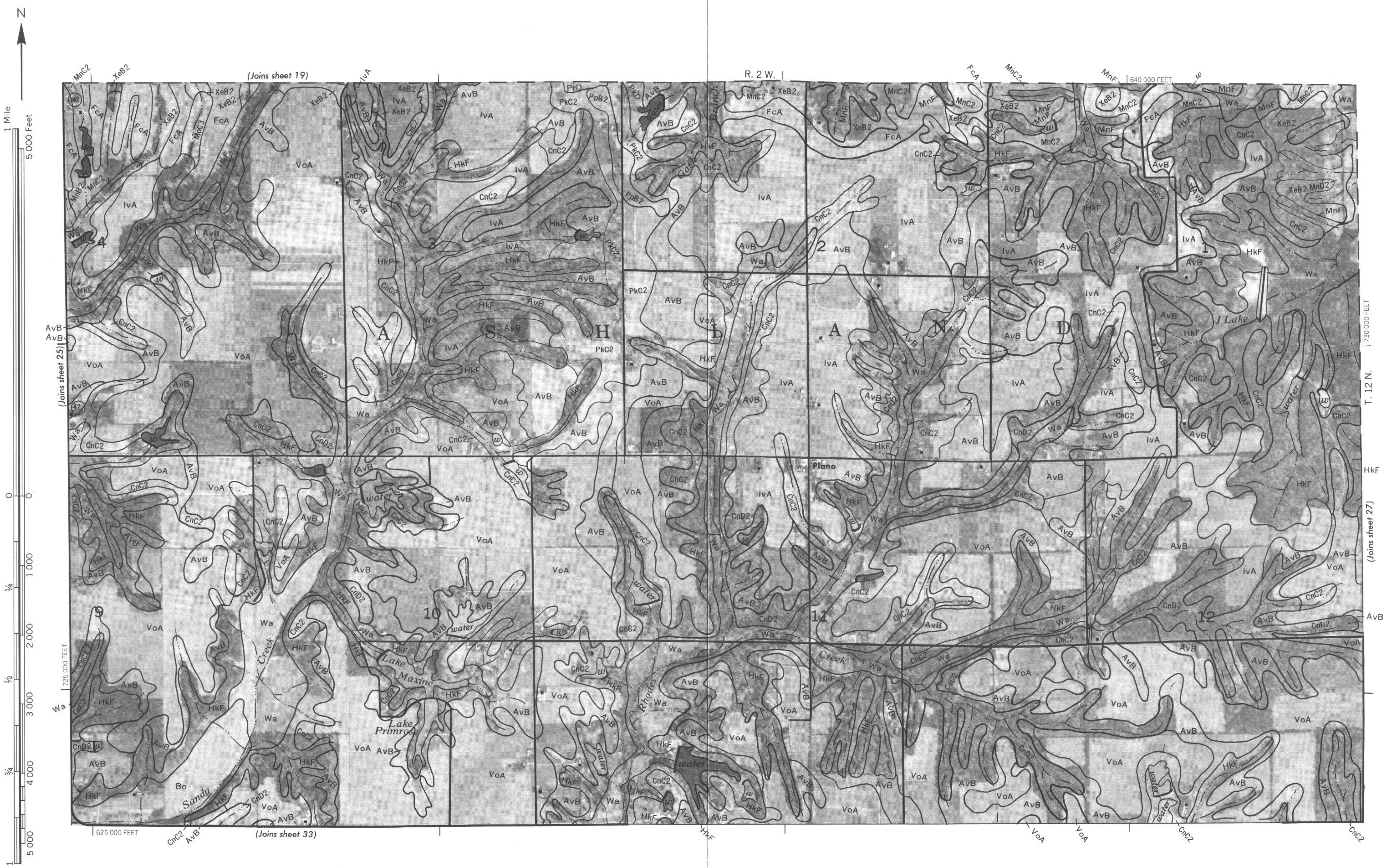


26



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MORGAN COUNTY, INDIANA NO. 27

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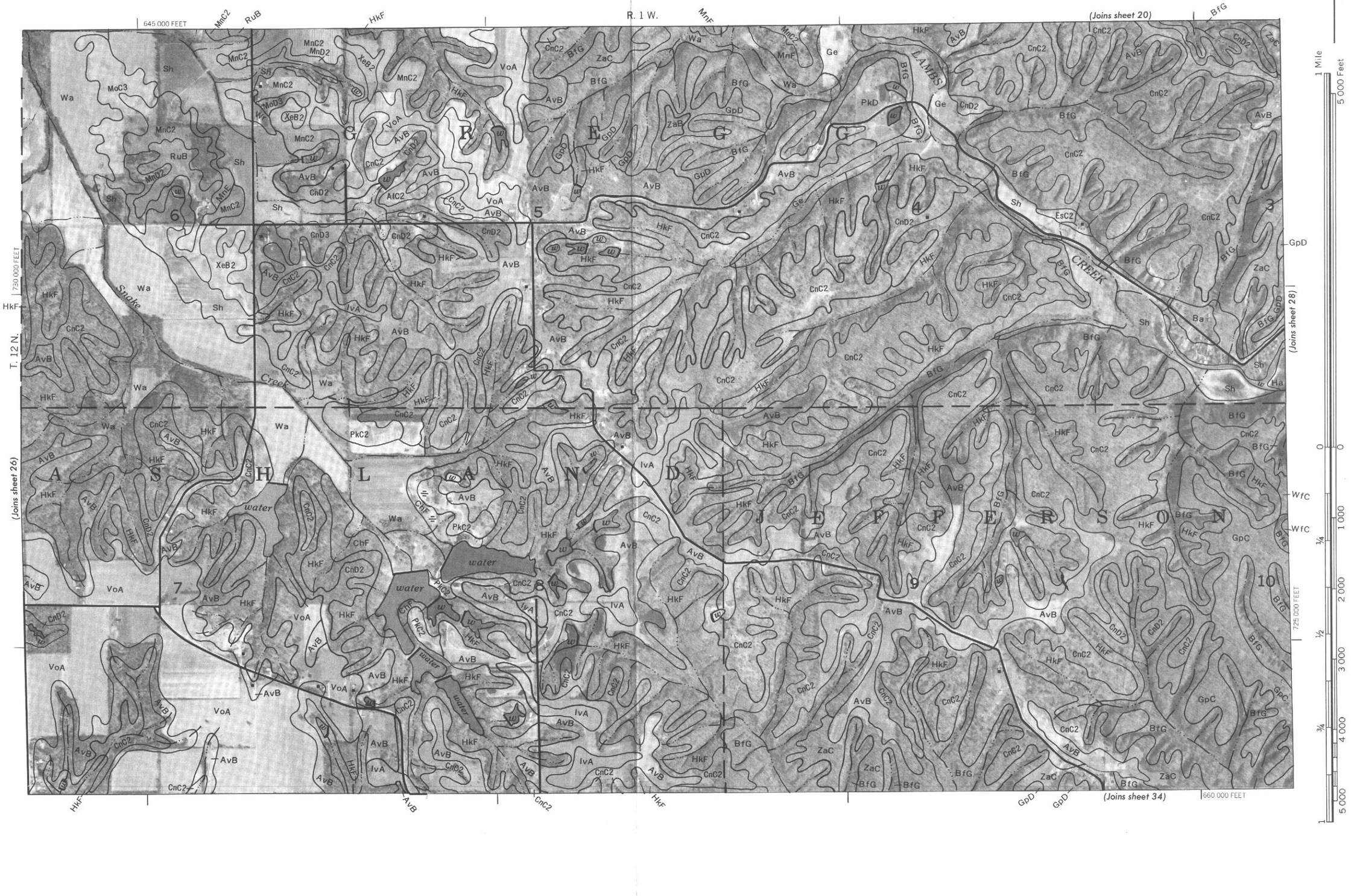

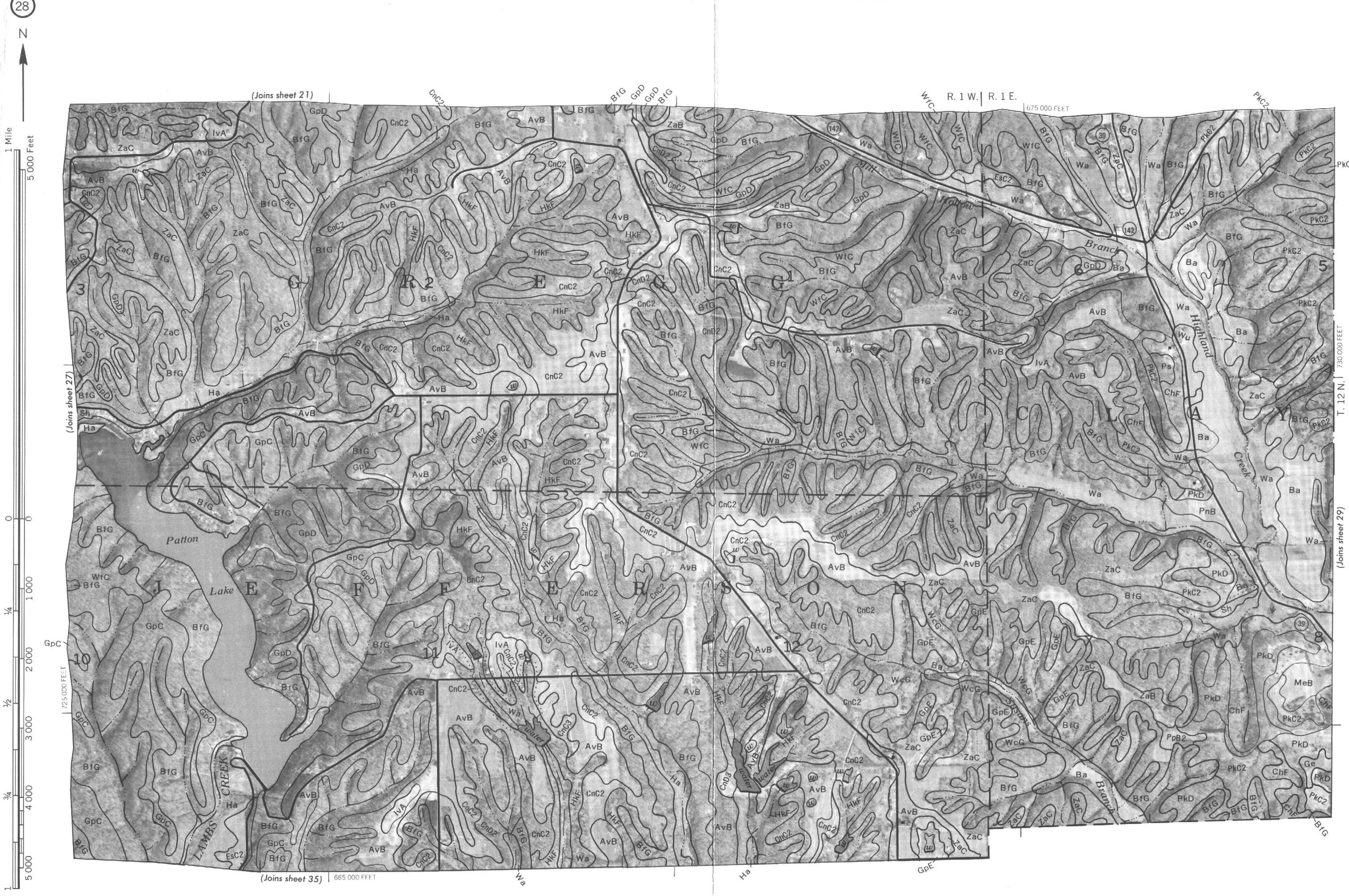

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MORGAN COUNTY, INDIANA NO. 29
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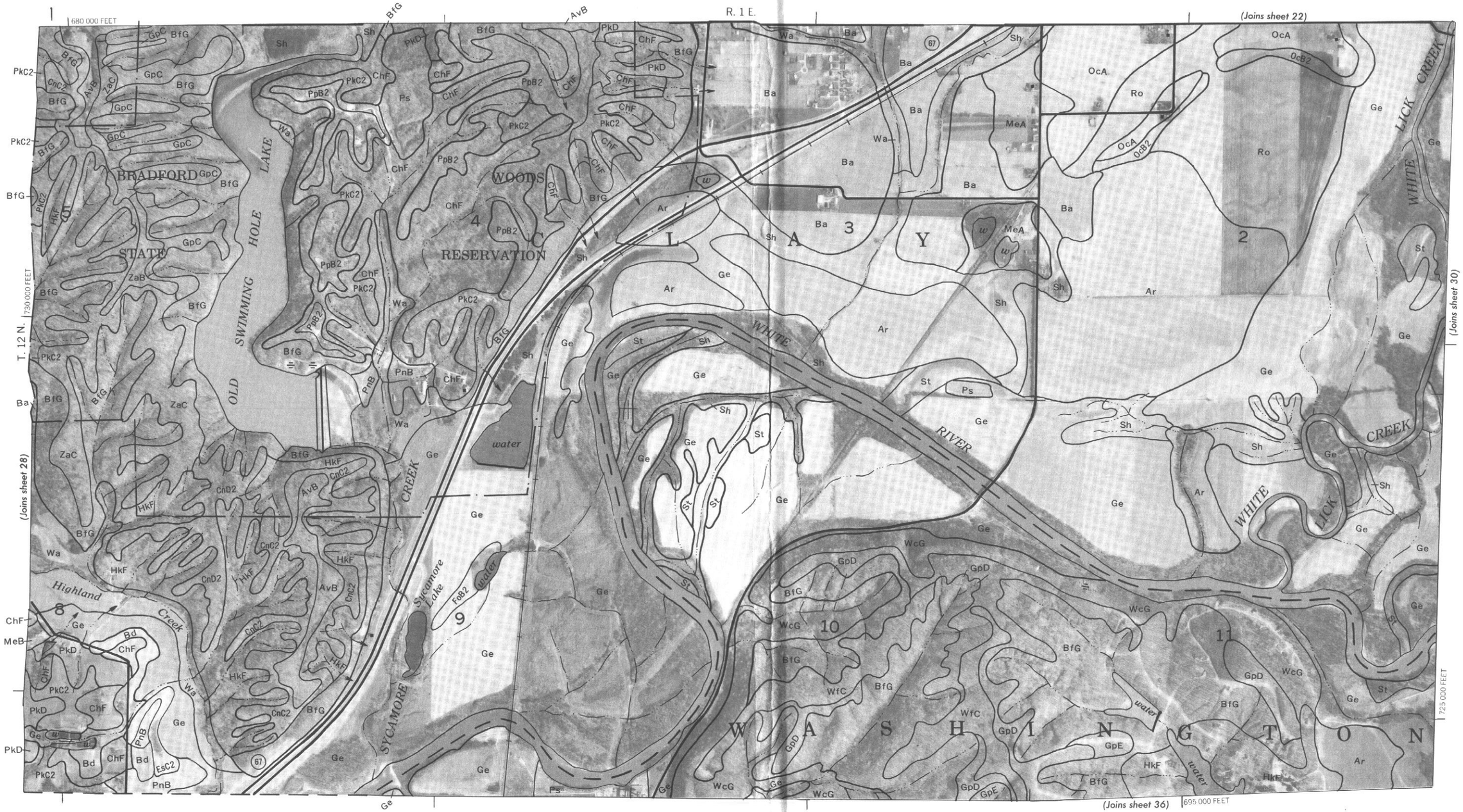
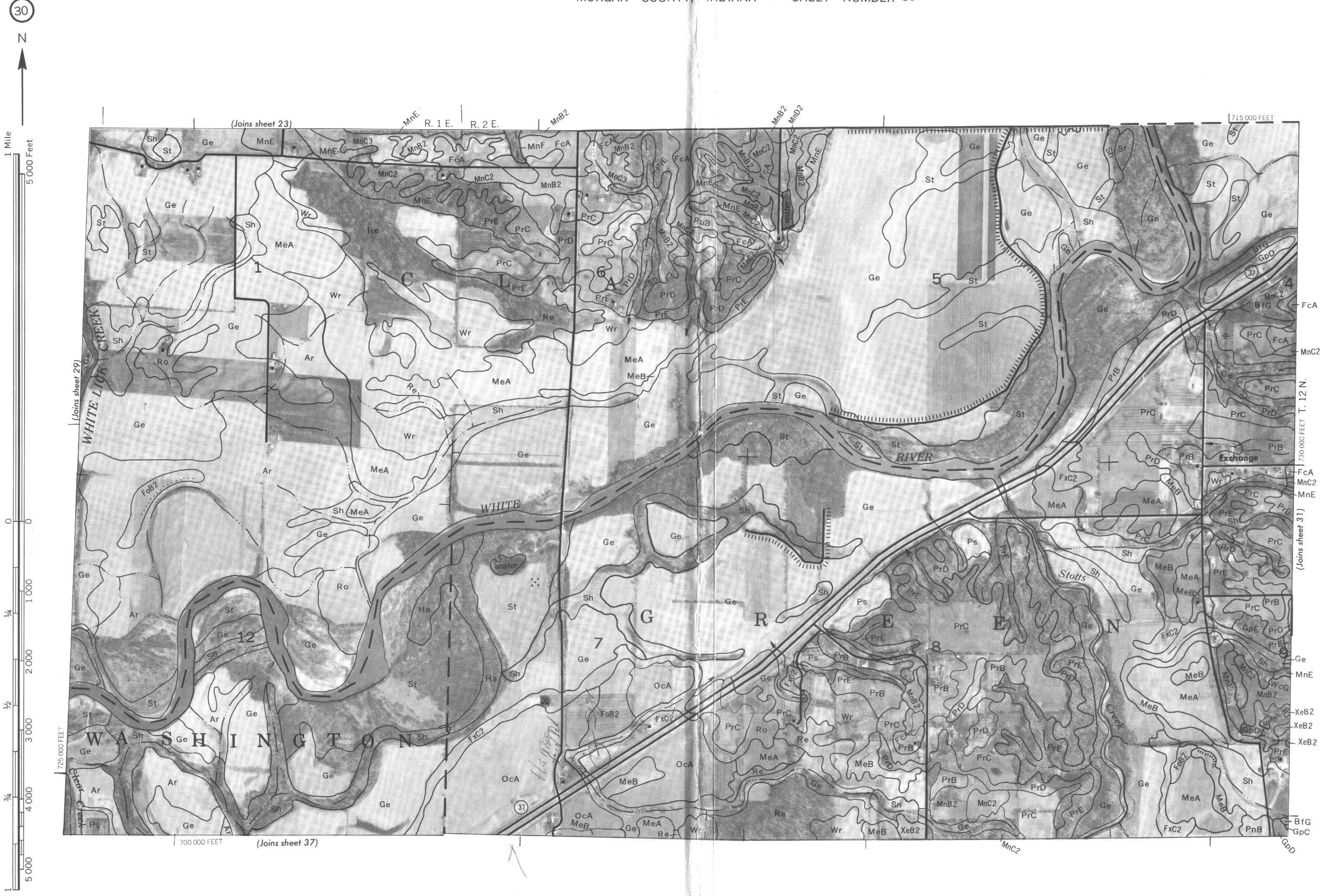
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

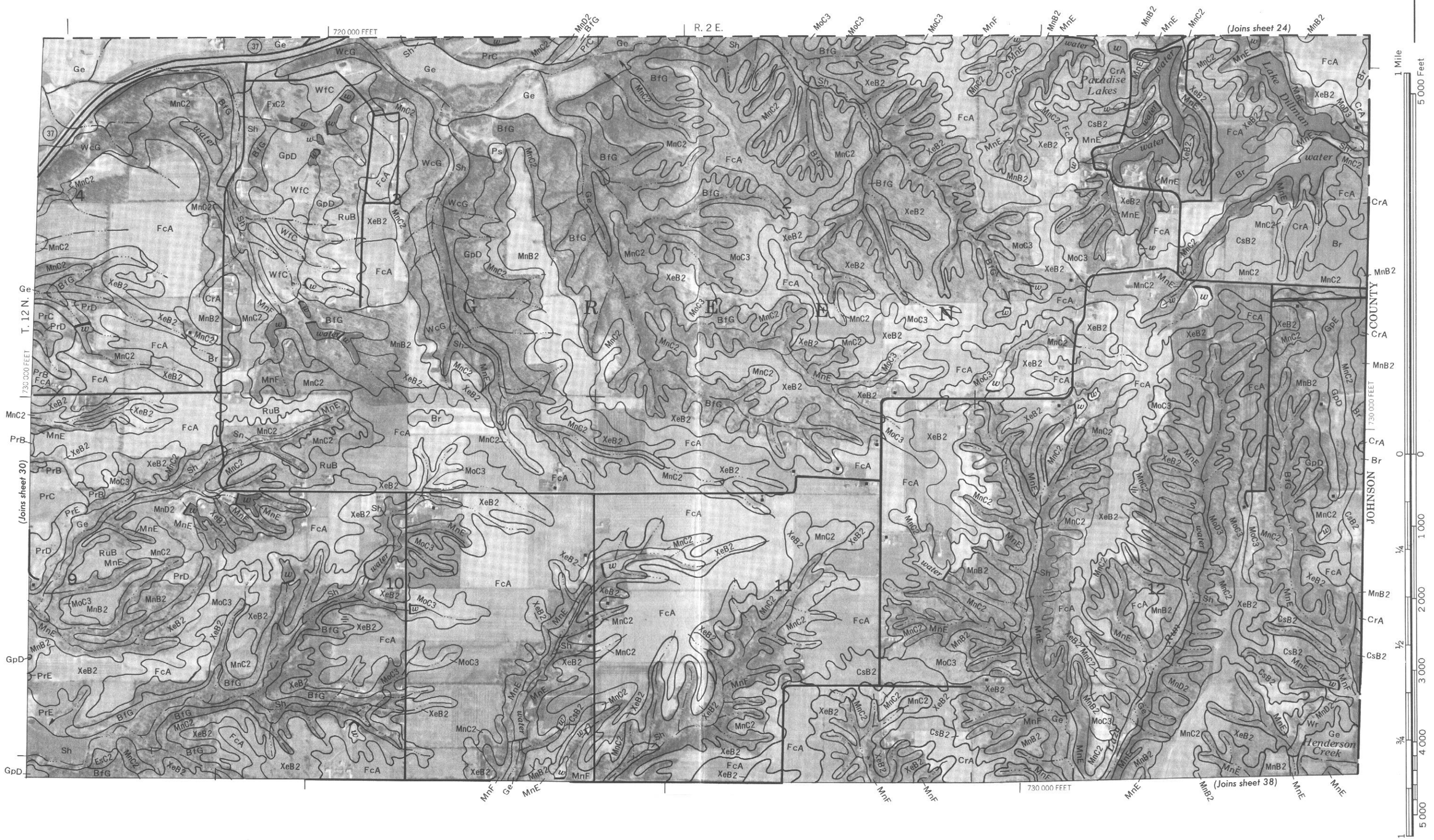




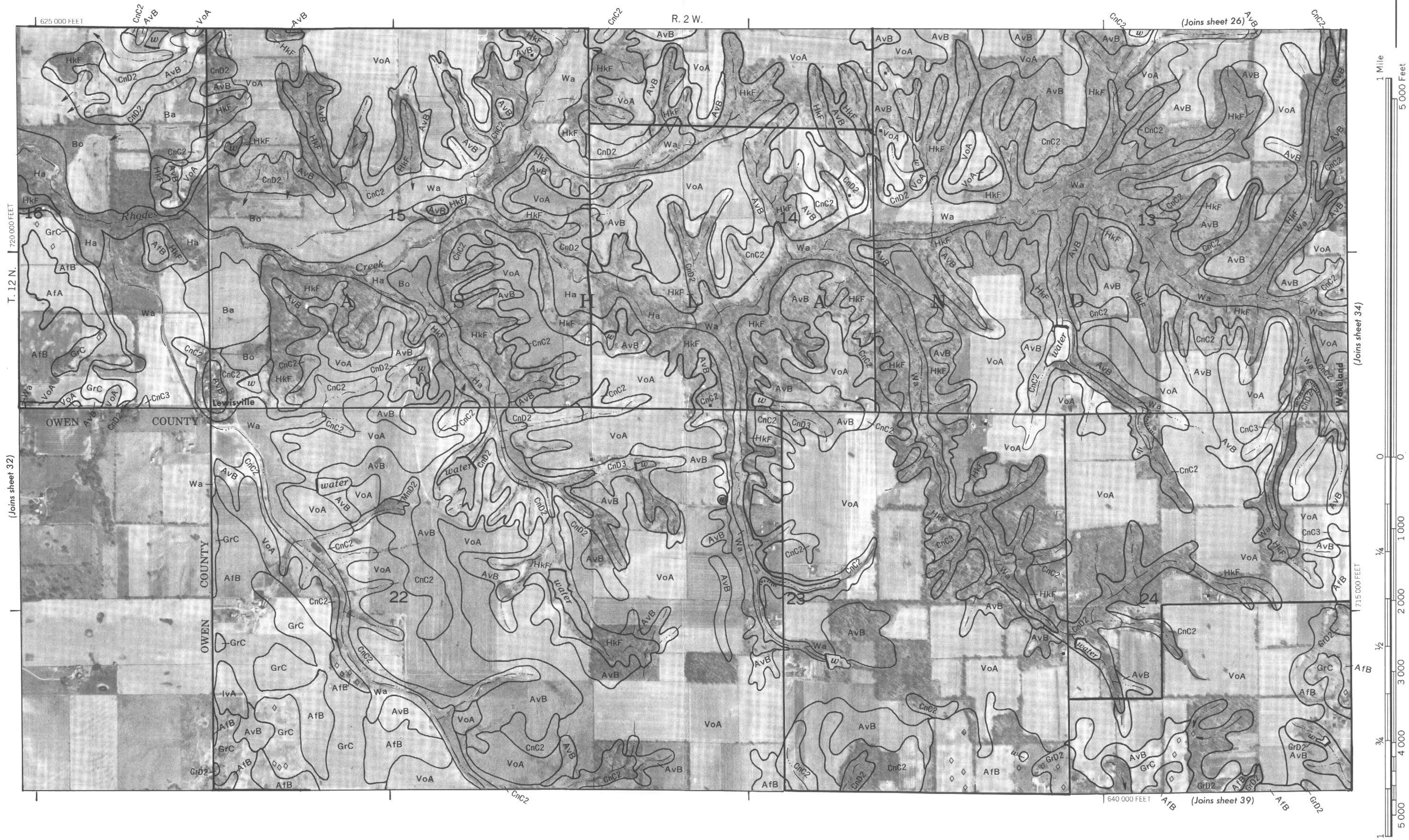
This map is compiled on 1974 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

MORGAN COUNTY, INDIANA NO. 30

MORGAN COUNTY, INDIANA NO. 31
This map is compiled on 1974 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.



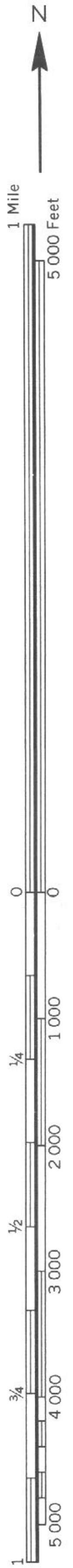
This map is compiled on 1974 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.



MORGAN COUNTY, INDIANA NO. 33

This map is compiled on 1974 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

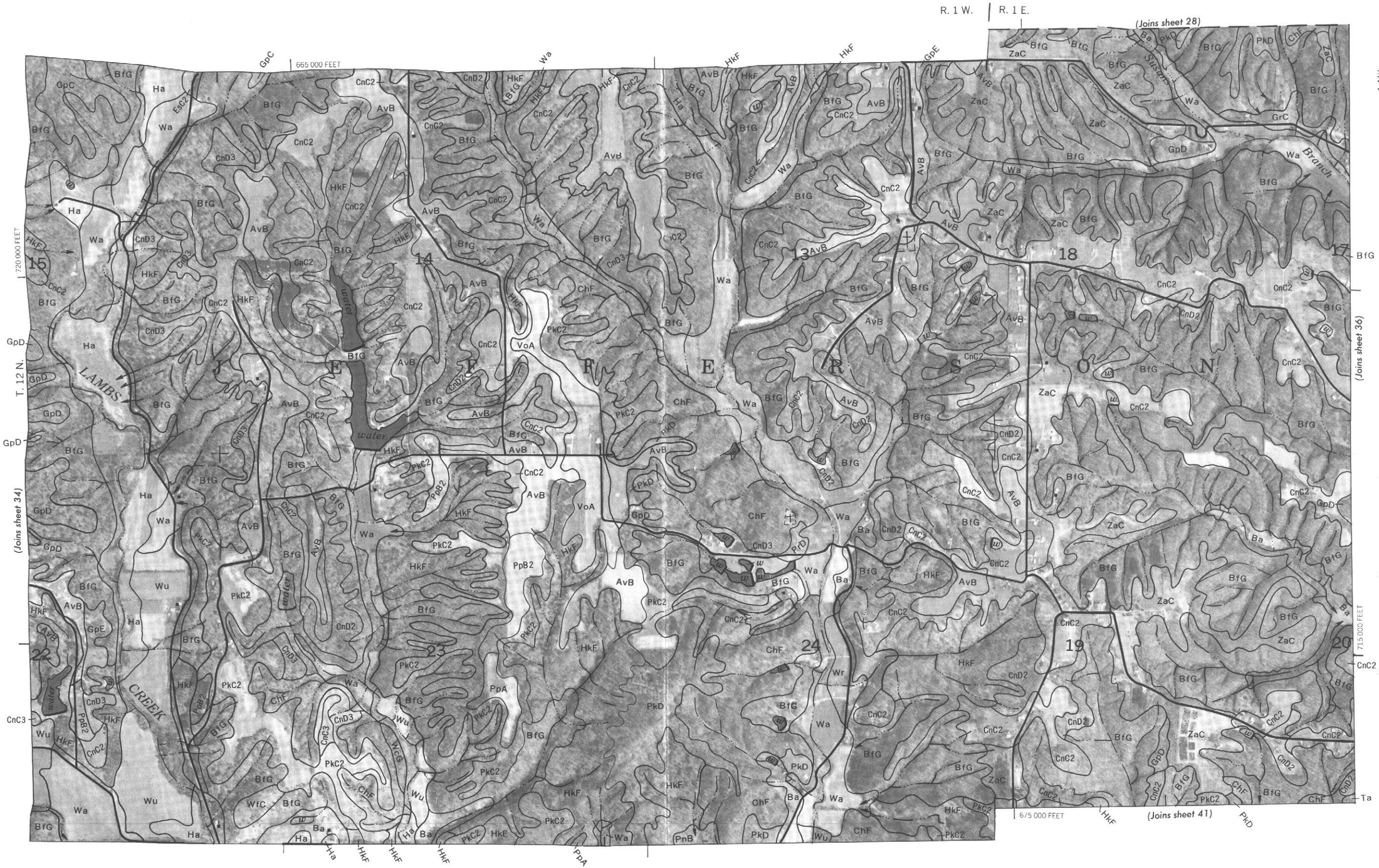
34



This map is compiled on 1974 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

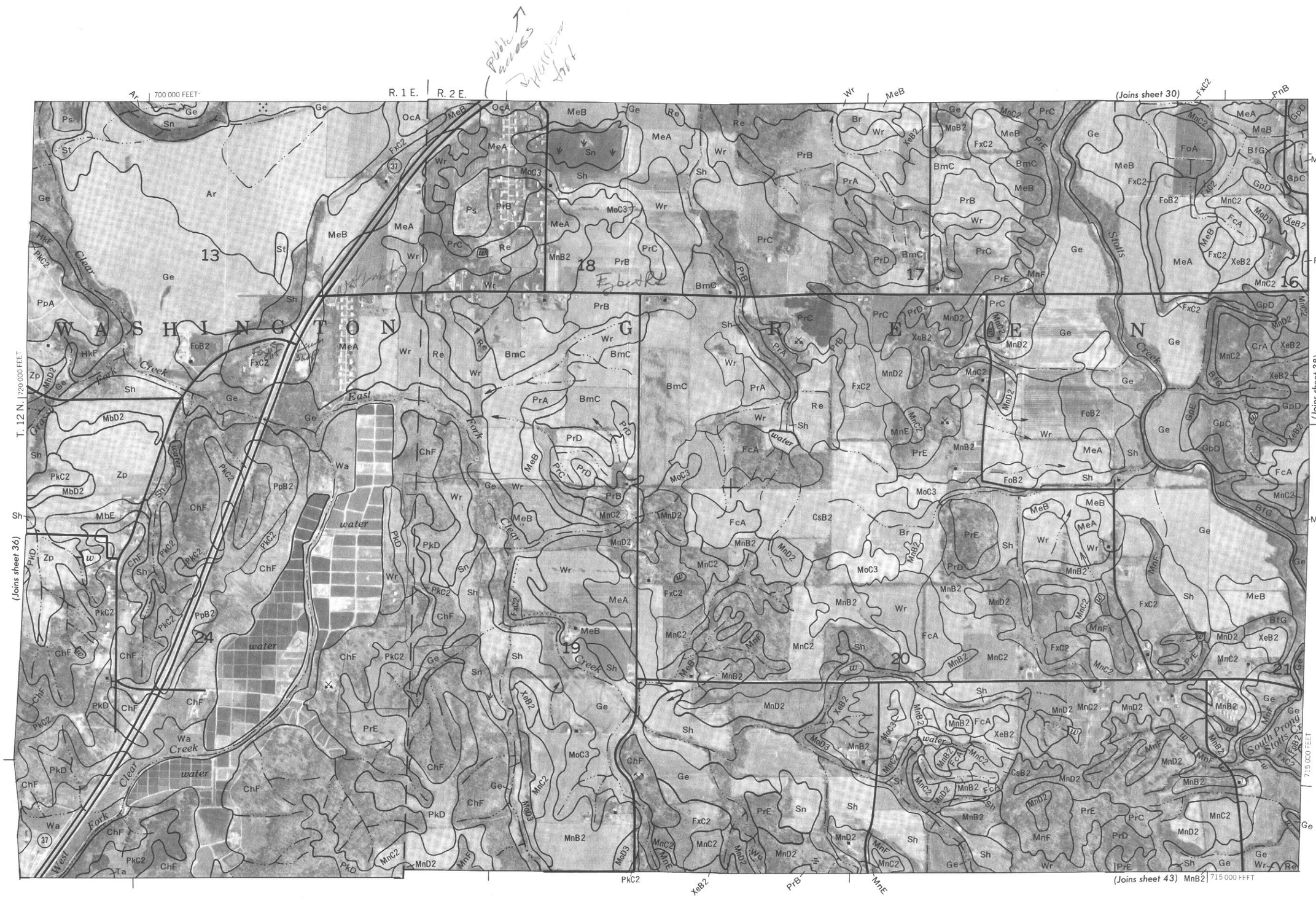
MORGAN COUNTY, INDIANA NO. 35

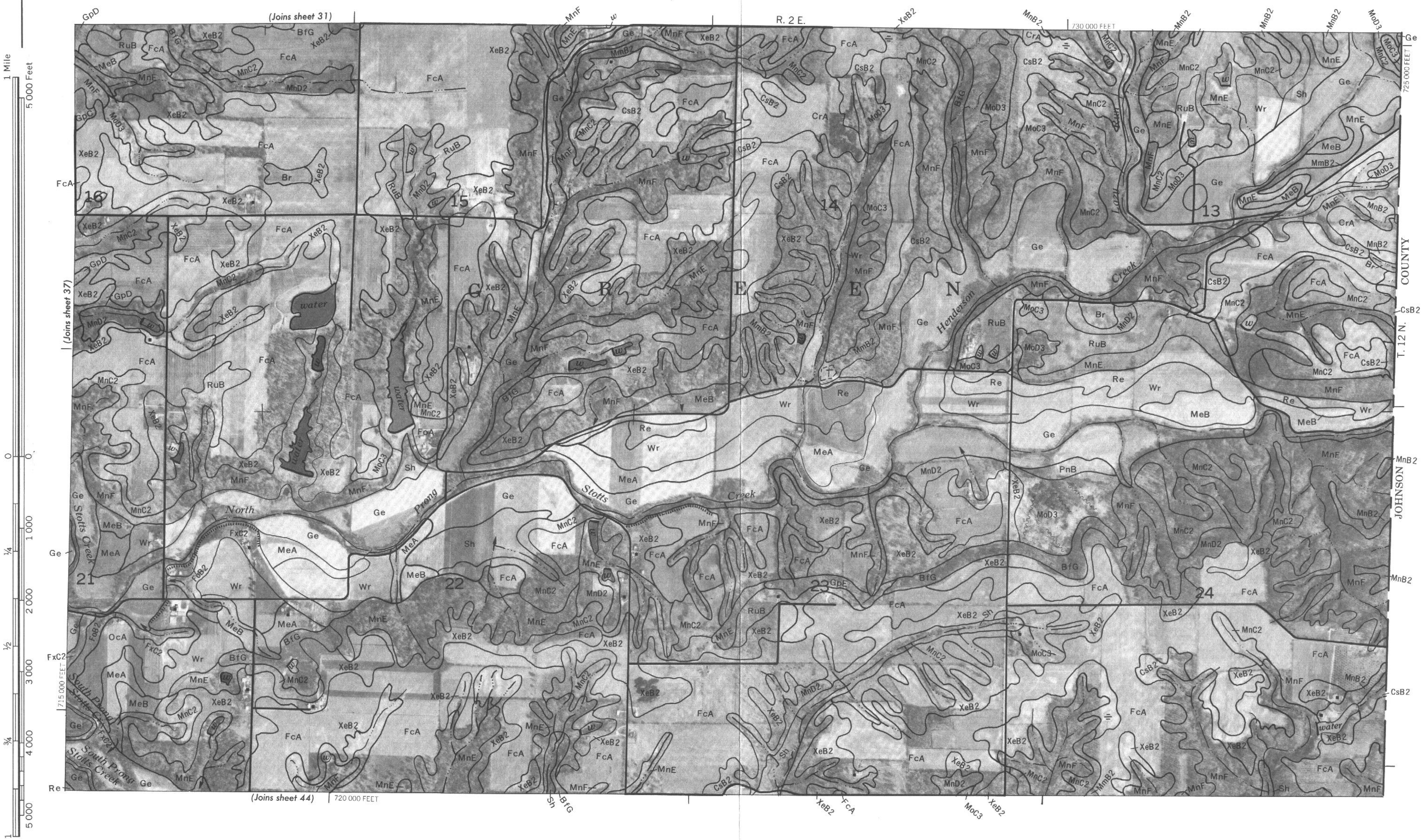
This map is compiled on 1974 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.



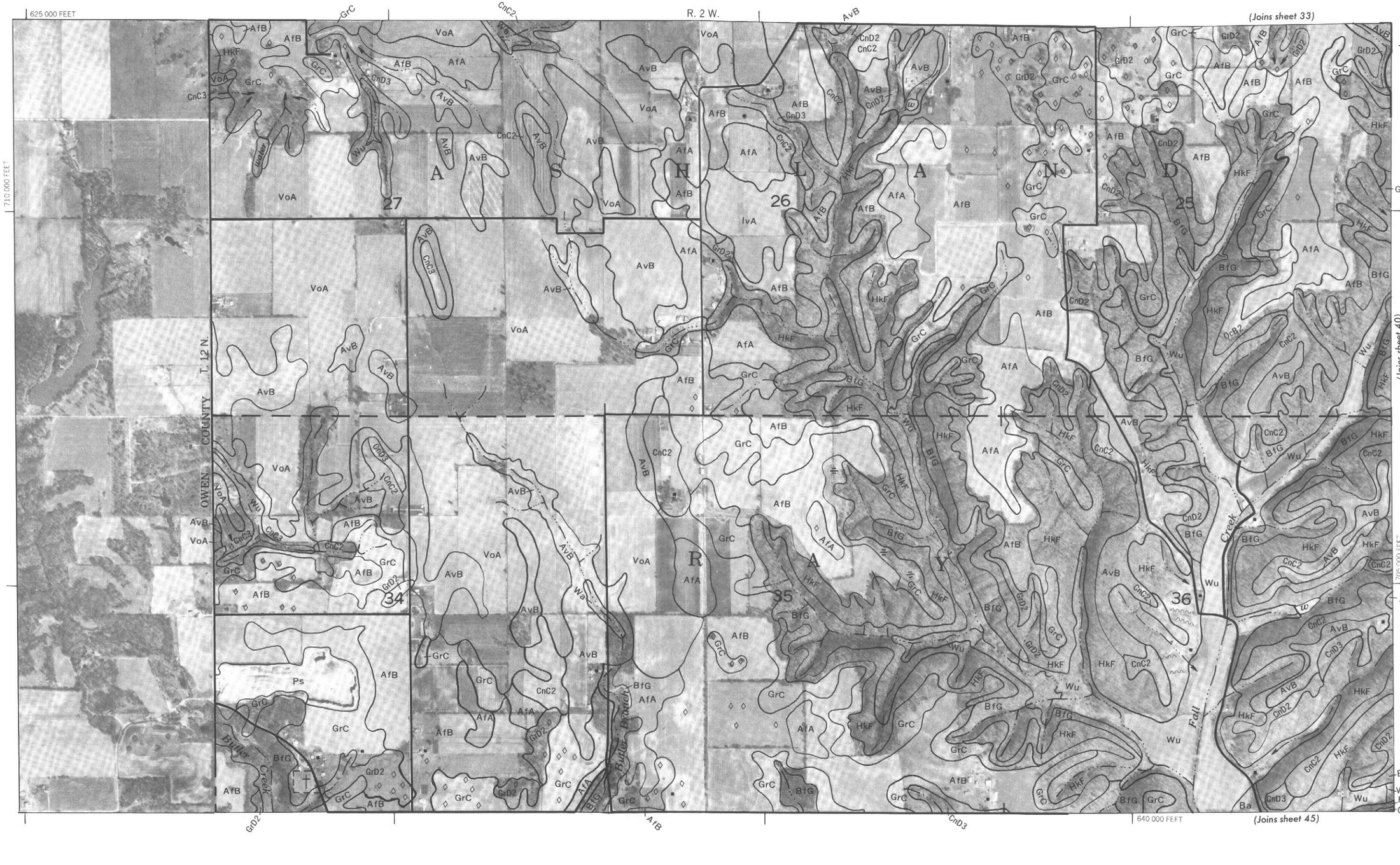
36

This map is compiled on 1974 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.





This map is compiled on 1974 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.



MORGAN COUNTY, INDIANA — SHEET NUMBER 40

This map is compiled on 1974 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

MORGAN COUNTY, INDIANA NO. 40

41

N

R. 1 W. | R. 1 E.

(Joins sheet 35)

665 000 FEET

710 000 FEET

T. 12 N.

(Joins sheet 40)

(Joins sheet 42)

(Joins sheet 47)

675 000 FEET

705 000 FEET

Edgewood Lake

Goose Creek

LAMBS CREEK

WHITE RIVER

WASHINGTON

1 Mile

5 000 Feet

1 0 ¼ 1 000 ½ 2 000 ¾ 3 000 1 4 000 5 000

MORGAN COUNTY, INDIANA NO. 41

This map is compiled on 1974 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

MORGAN COUNTY, INDIANA — SHEET NUMBER 42

42

N

1 Mile

5 000 Feet

0 0

¼ 1 000

2 000

½ 3 000

¾ 4 000

1 5 000

(Joins sheet 36)

R. 1 E.

695 000 FEET

710 000 FEET

705 000 FEET

680 000 FEET

(Joins sheet 41)

(Joins sheet 43)

(Joins sheet 48)

JEFFERSON

HARRISON

WHITE RIVER

West Fork Clear Creek

MARTINSVILLE

water

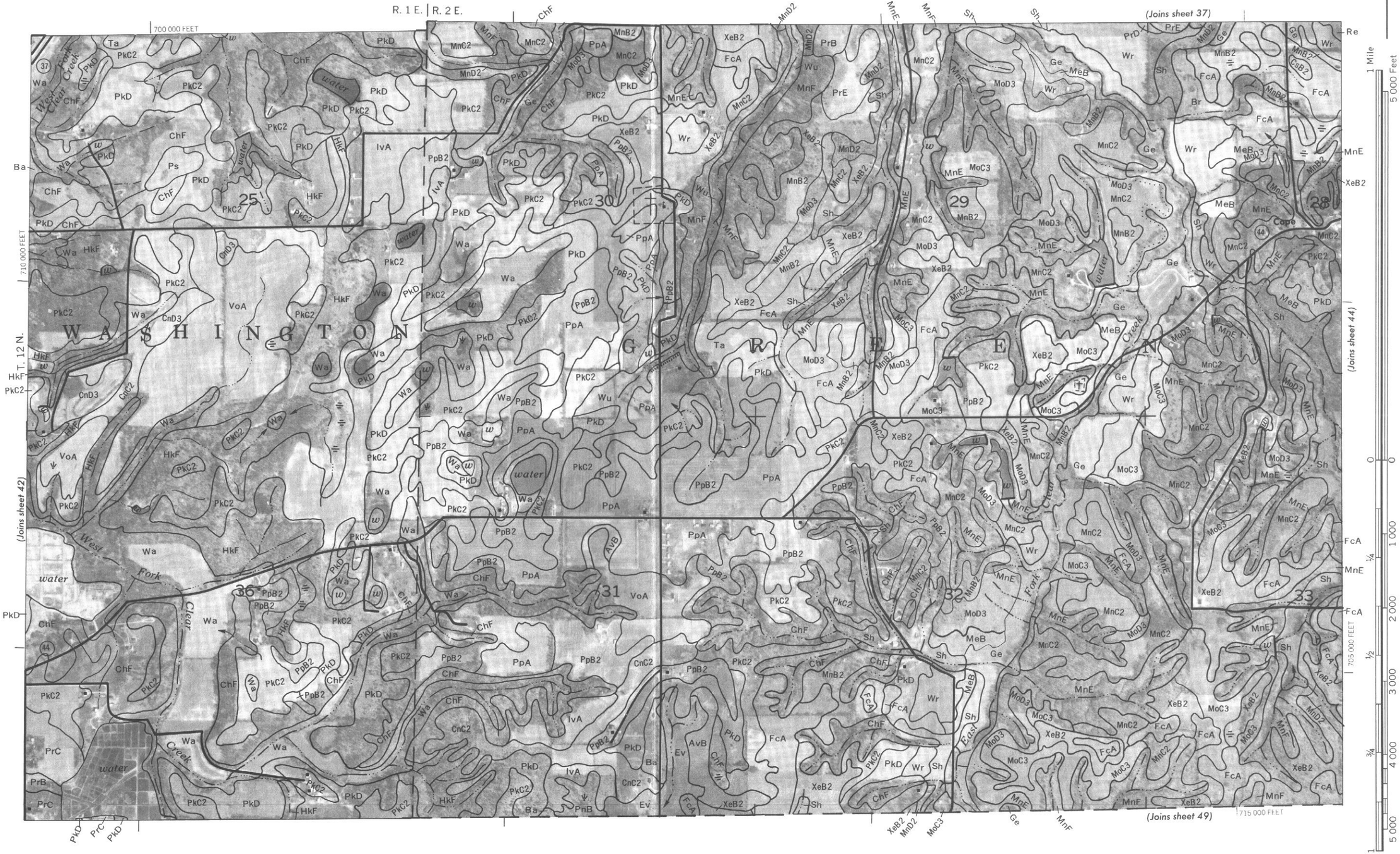
29 28 27 26 32 33 34 35

T. 12 N.

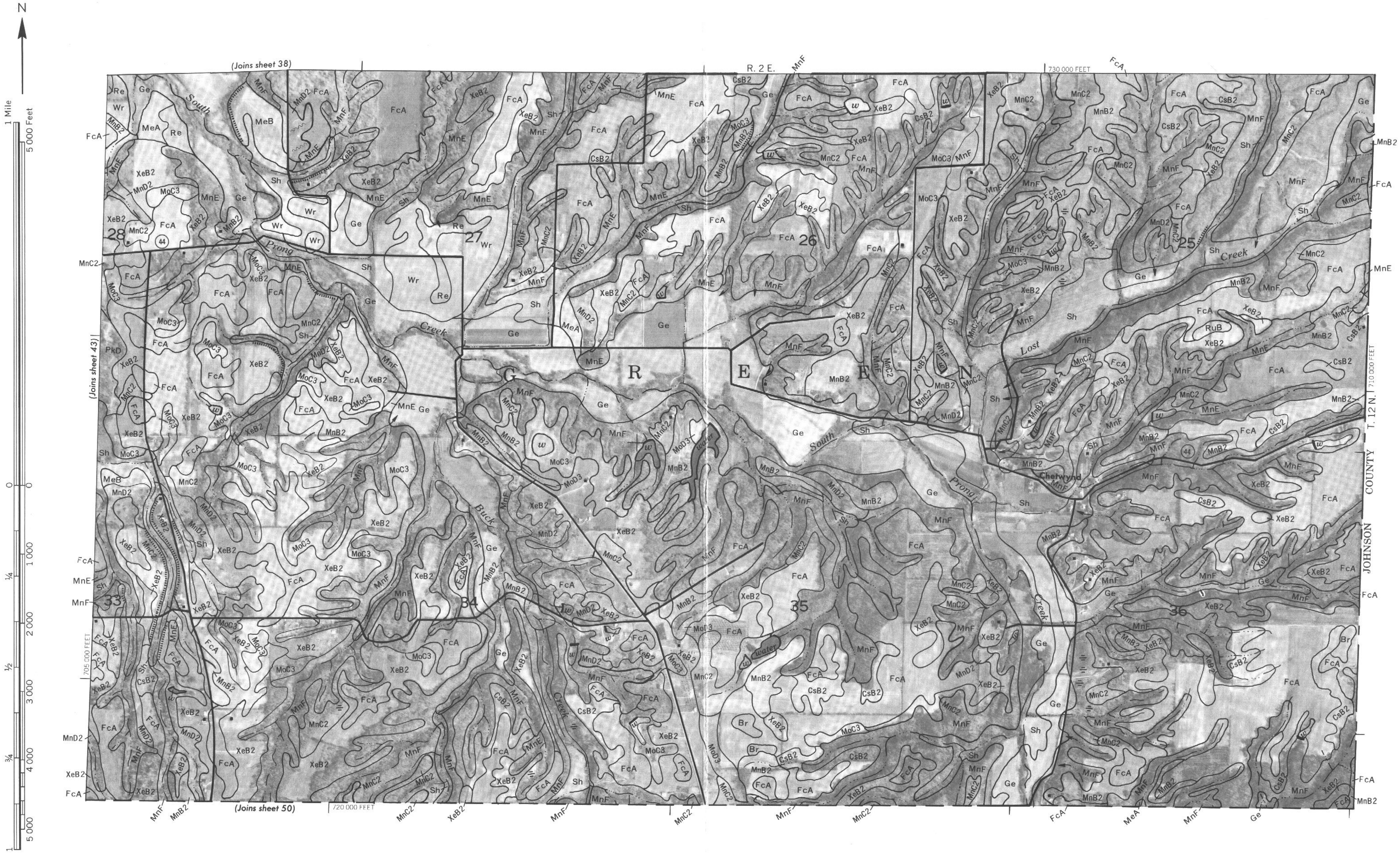
This map is compiled on 1974 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

MORGAN COUNTY, INDIANA NO. 42

MORGAN COUNTY, INDIANA NO. 43
This map is compiled on 1974 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and tied division corners, if shown, are approximately positioned.



MORGAN COUNTY, INDIANA — SHEET NUMBER 44

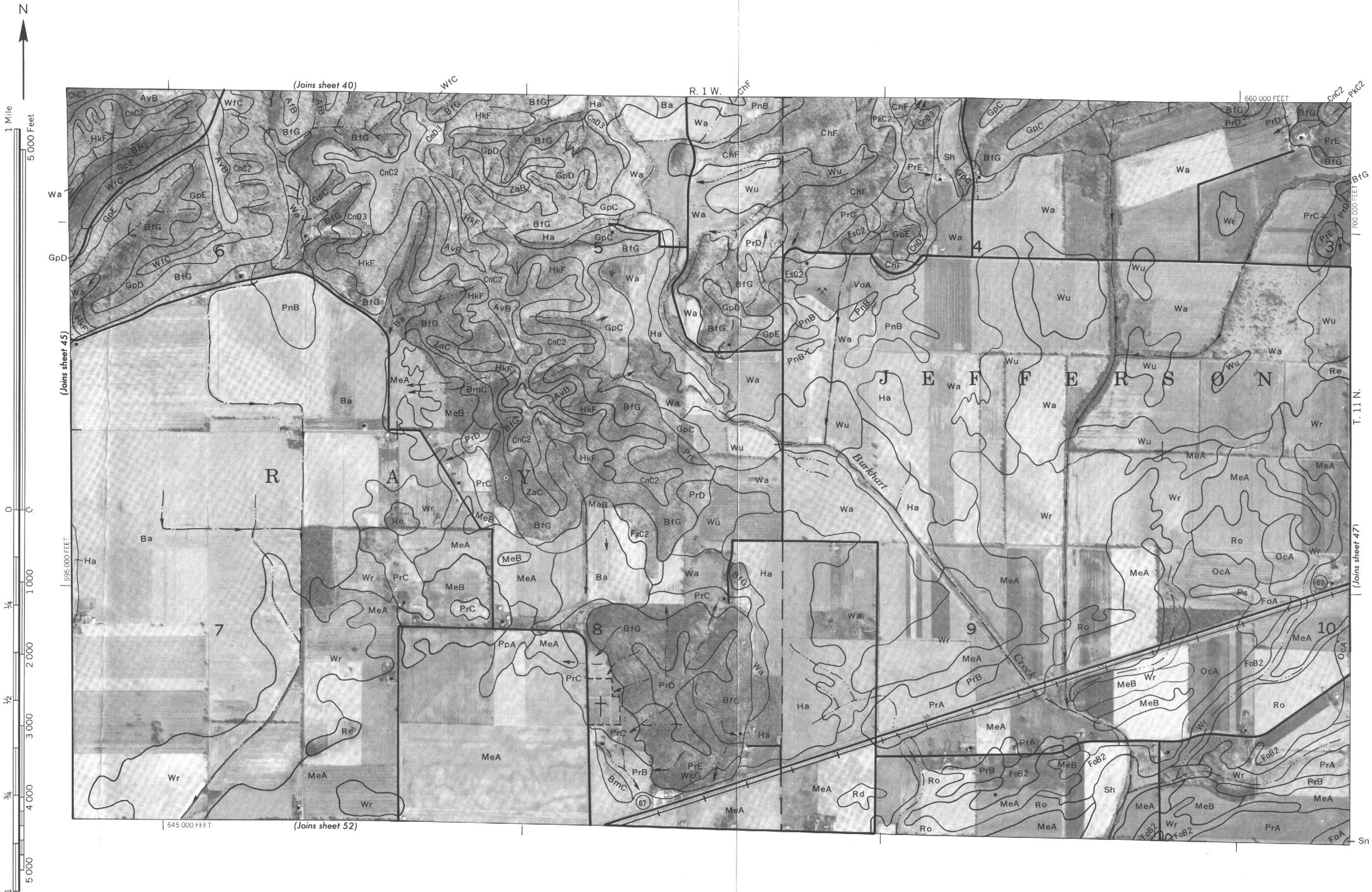


This map is compiled on 1974 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

MORGAN COUNTY, INDIANA NO. 44

MORGAN COUNTY, INDIANA NO. 45

This map is compiled on 1974 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.



This map is compiled on 1974 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

N

1 Mile

5 000 Feet

665 000 FEET

700 000 FEET

R. 1 W. | R. 1 E.

T. 11 N.

(Joins sheet 41)

(Joins sheet 46)

(Joins sheet 48)

(Joins sheet 53)

695 000 FEET

680 000 FEET

JEFFERSON

WASHINGTON

WHITE RIVER

LAMBS CREEK

INDIAN CREEK

water

0 1/4 1/2 3/4 1

0 1 000 2 000 3 000 4 000 5 000

48

N

1 Mile

5 000 Feet

0 ¼ ½ ¾ 1

0 1 000 2 000 3 000 4 000 5 000

(Joins sheet 42)

R. 1 E.

695 000 FEET

720 000 FEET

T. 11 N.

(Joins sheet 47)

(Joins sheet 49)

(Joins sheet 54)

685 000 FEET

MARTINSVILLE

WASHINGTON

Spring Lake

water

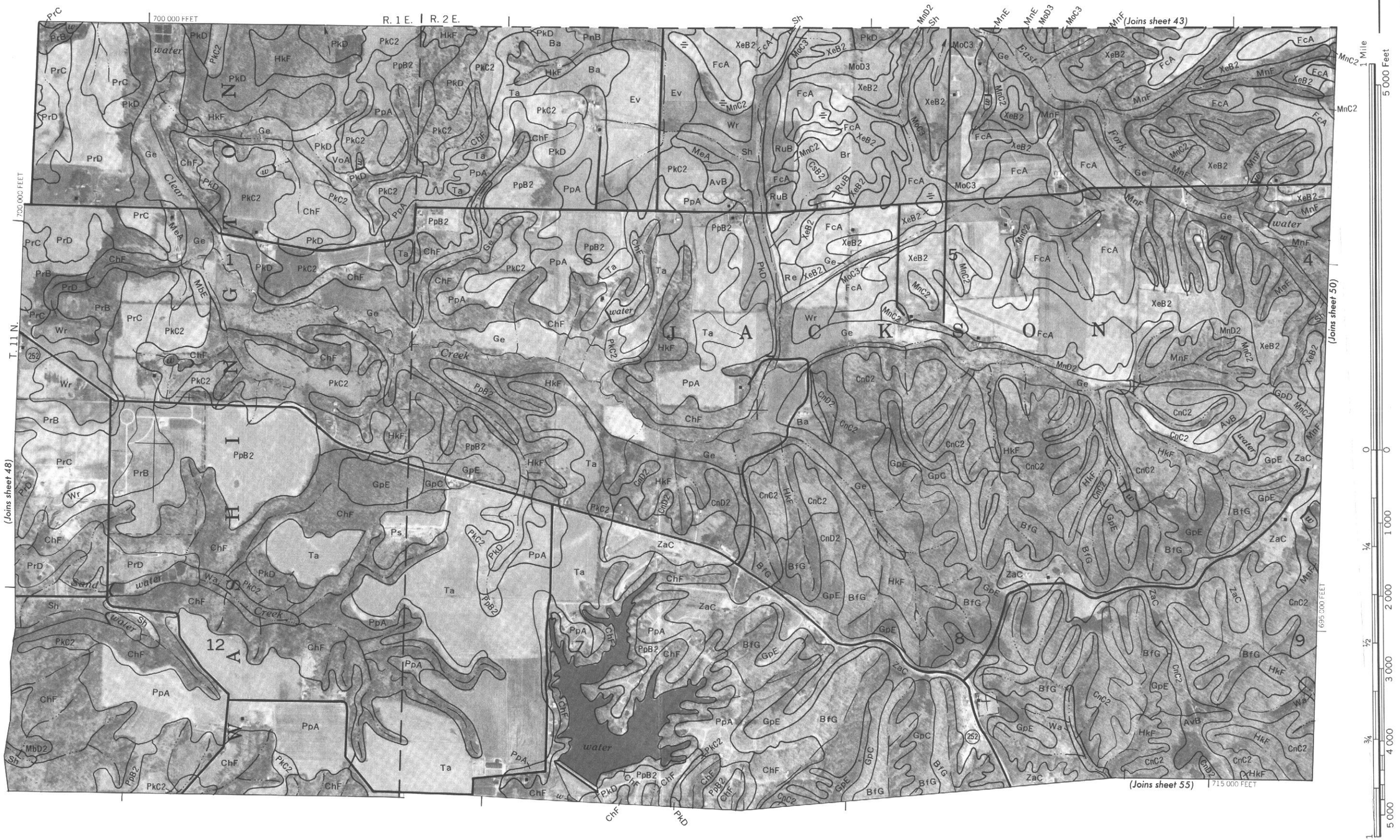
INDIAN CREEK

Sand Creek

This map is compiled on 1974 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

MORGAN COUNTY, INDIANA NO. 48

MORGAN COUNTY, INDIANA NO. 49
This map is compiled on 1974 aerial photography by the U.S. Department of Agriculture Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.



50

N

1 Mile

5 000 Feet

0 0 ¼ 1 000 ½ 2 000 ¾ 3 000 1 4 000 5 000

(Joins sheet 44)

R. 2 E.

735 000 FEET

700 000 FEET

T. 11 N.

695 000 FEET

720 000 FEET

(Joins sheet 49)

(Joins sheet 56)

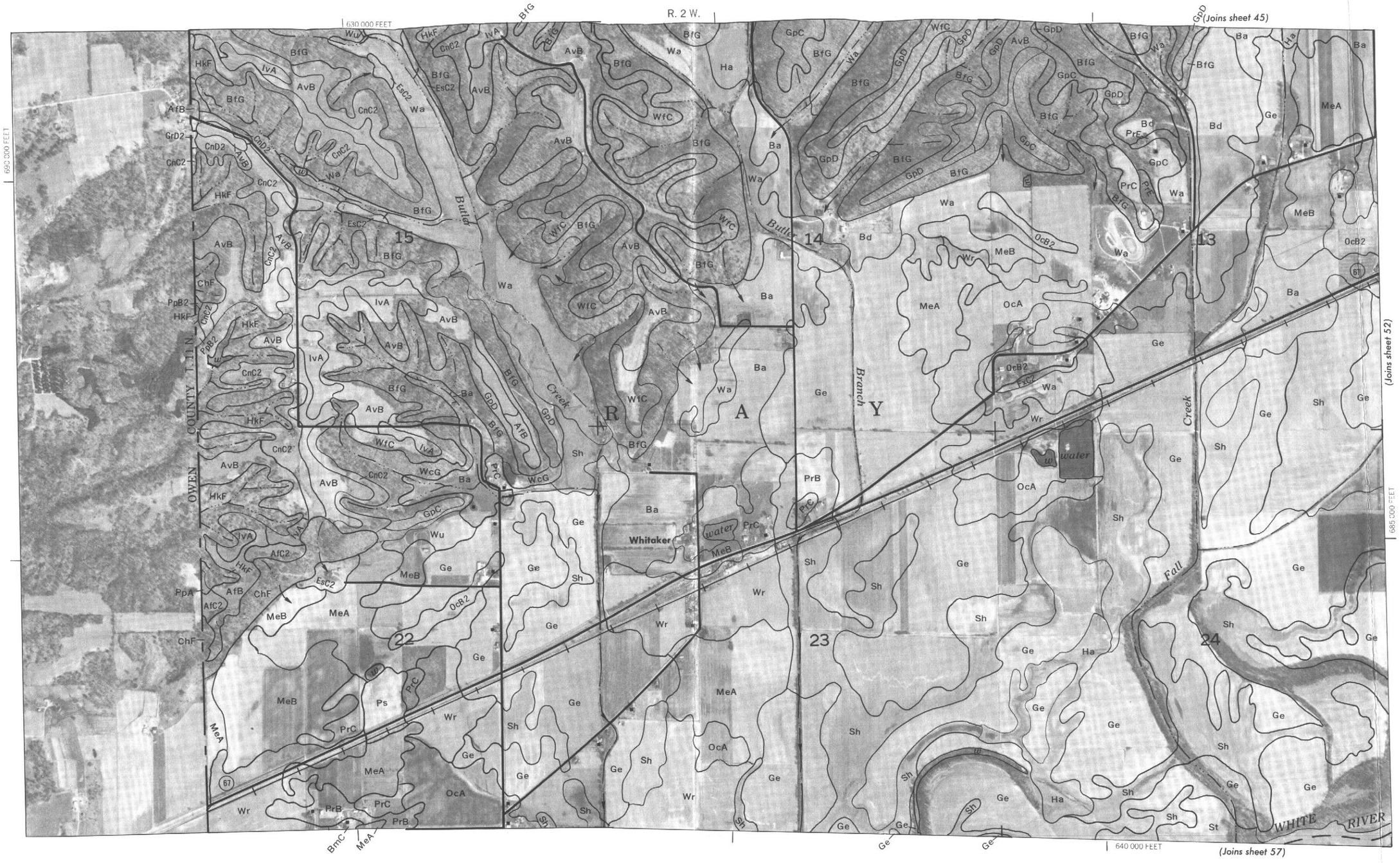
JOHNSON COUNTY

MORGAN COUNTY, INDIANA NO. 50

This map is compiled on 1971 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

MORGAN COUNTY, INDIANA NO. 51

This map is compiled on 1974 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.



51

N

1 Mile

5 000 Feet

0 0
¼ 1 000
½ 2 000
¾ 3 000
1 4 000
5 000

MORGAN COUNTY, INDIANA — SHEET NUMBER 52

This map is compiled on 1974 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

MORGAN COUNTY, INDIANA NO. 53
This map is compiled on 1974 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

53

N

1 Mile

5 000 Feet

665 000 FEET

690 000 FEET

R. 1 W. | R. 1 E.

(Joins sheet 47)

T. 11 N.

(Joins sheet 52)

(Joins sheet 54)

(Joins sheet 59)

675 000 FEET

685 000 FEET

JEFFERSON

BARKER

WASHINGTON

INDIAN CREEK

WHITE RIVER

Little Buckner Branch

Indian Jordan Creek

15 14 13 18 17 22 23 24 19 20

1 000 FEET

0 1/4 1/2 3/4 1

0 1 000 2 000 3 000 4 000 5 000

54

N

1 Mile

5 000 Feet

(Joins sheet 48)

R. 1 E.

695 000 FEET

690 000 FEET

685 000 FEET

680 000 FEET

T. 11 N.

(Joins sheet 53)

(Joins sheet 55)

(Joins sheet 60)

MORGAN

MONROE

STATE FOREST

INDIAN CREEK

Sand Creek

Buckner Branch

water

17 16 15 14 20 21 22 23

0 0 1/4 1 000 1/2 2 000 3/4 4 000 1 5 000

This map is compiled on 1972 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

MORGAN COUNTY, INDIANA NO. 54

This map is compiled on 1974 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned

MORGAN COUNTY, INDIANA NO. 55

56

N

1 Mile

5,000 Feet

0 0 1/4 1,000 1/2 2,000 3/4 3,000 4,000 5,000 1

R. 2 E.

735 000 FEET

690 000 FEET

685 000 FEET

720 000 FEET

T. 11 N.

COUNTY

JOHNSON

MORGANTOWN

(Joins sheet 50)

(Joins sheet 55)

(Joins sheet 62)

Crooked Cr.

Crooked Creek

Long Run

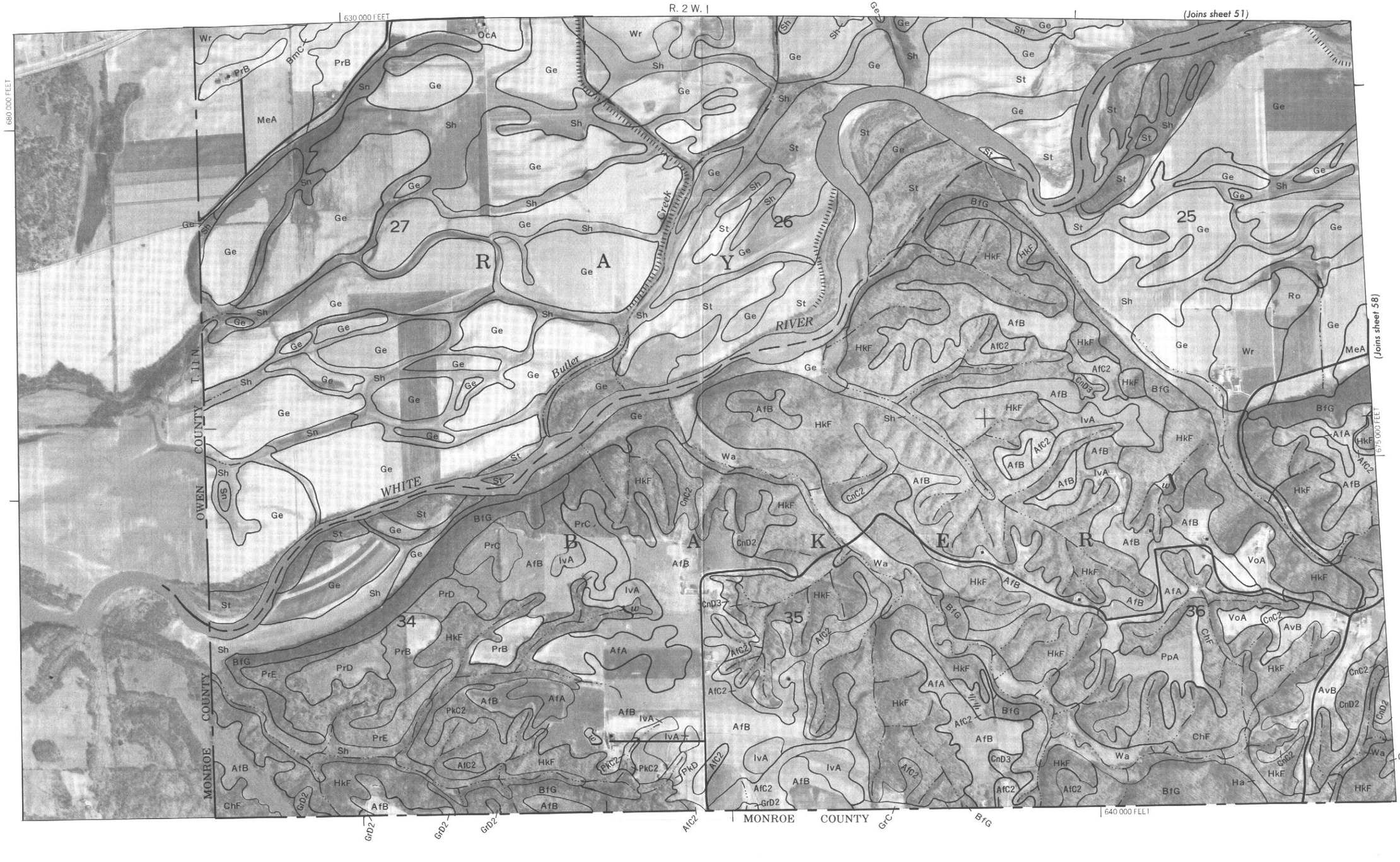
Oliver Creek

This map is compiled on 1974 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

MORGAN COUNTY, INDIANA NO. 56

MORGAN COUNTY, INDIANA NO. 57

This map is compiled on 1974 aerial photography by the U.S. Department of Agriculture Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.



57

N

1 Mile

5 000 Feet

0 0
¼ 1 000
½ 2 000
¾ 3 000
1 4 000
5 000

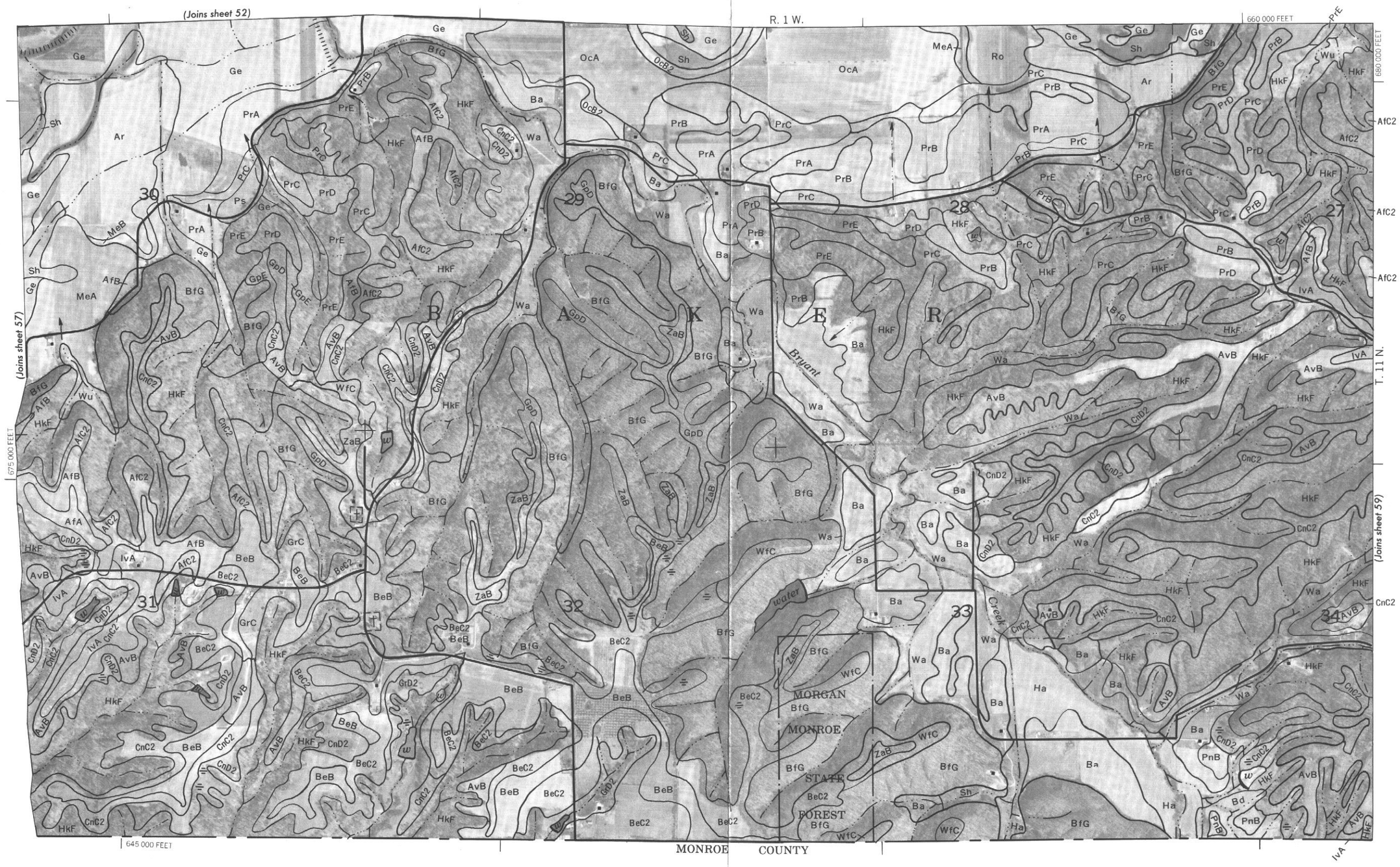
58

N

1 Mile

5 000 Feet

0 0 ¼ 1 000 ½ 2 000 ¾ 4 000 1 5 000

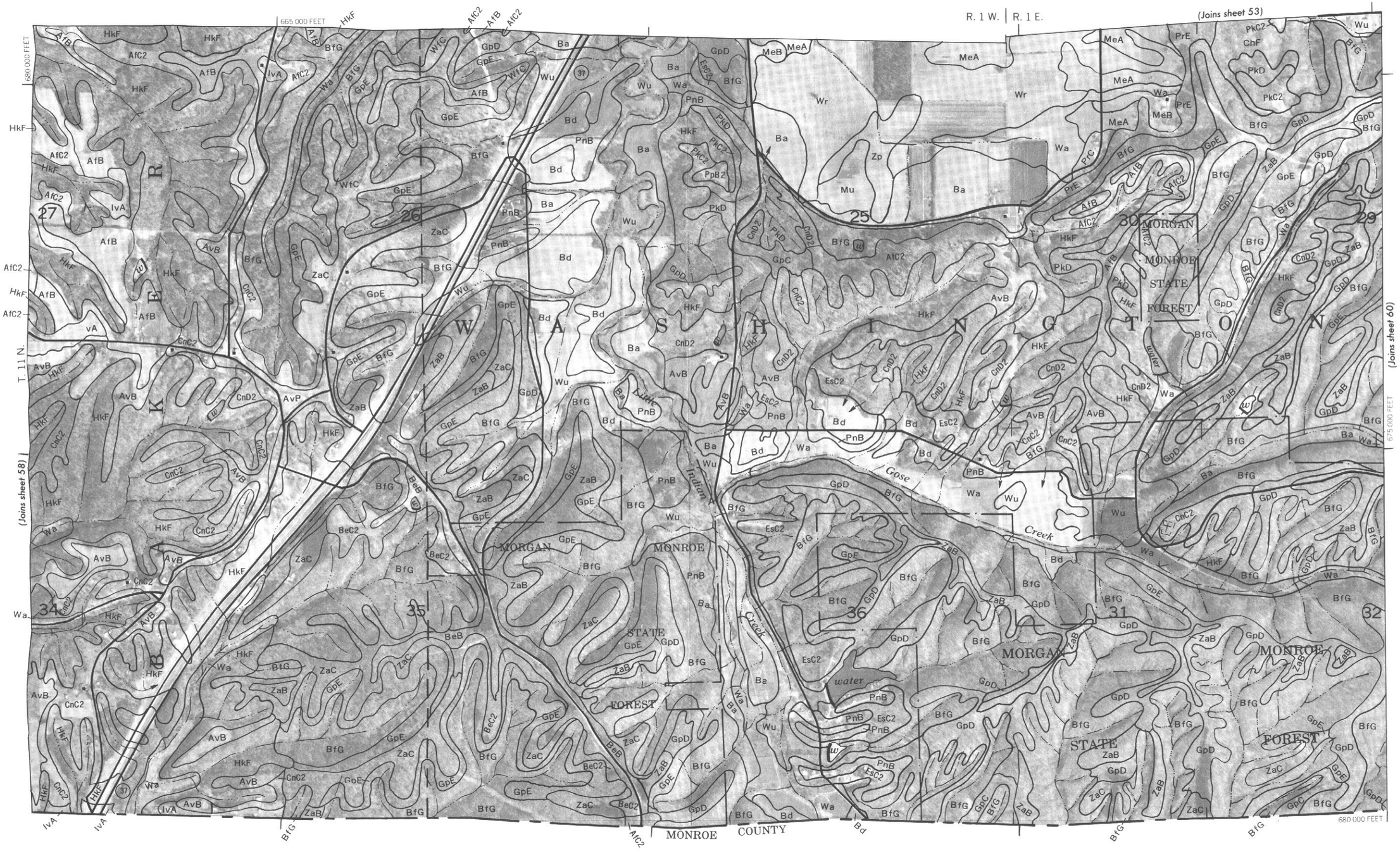


This map is compiled on 1974 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

MORGAN COUNTY, INDIANA NO. 58

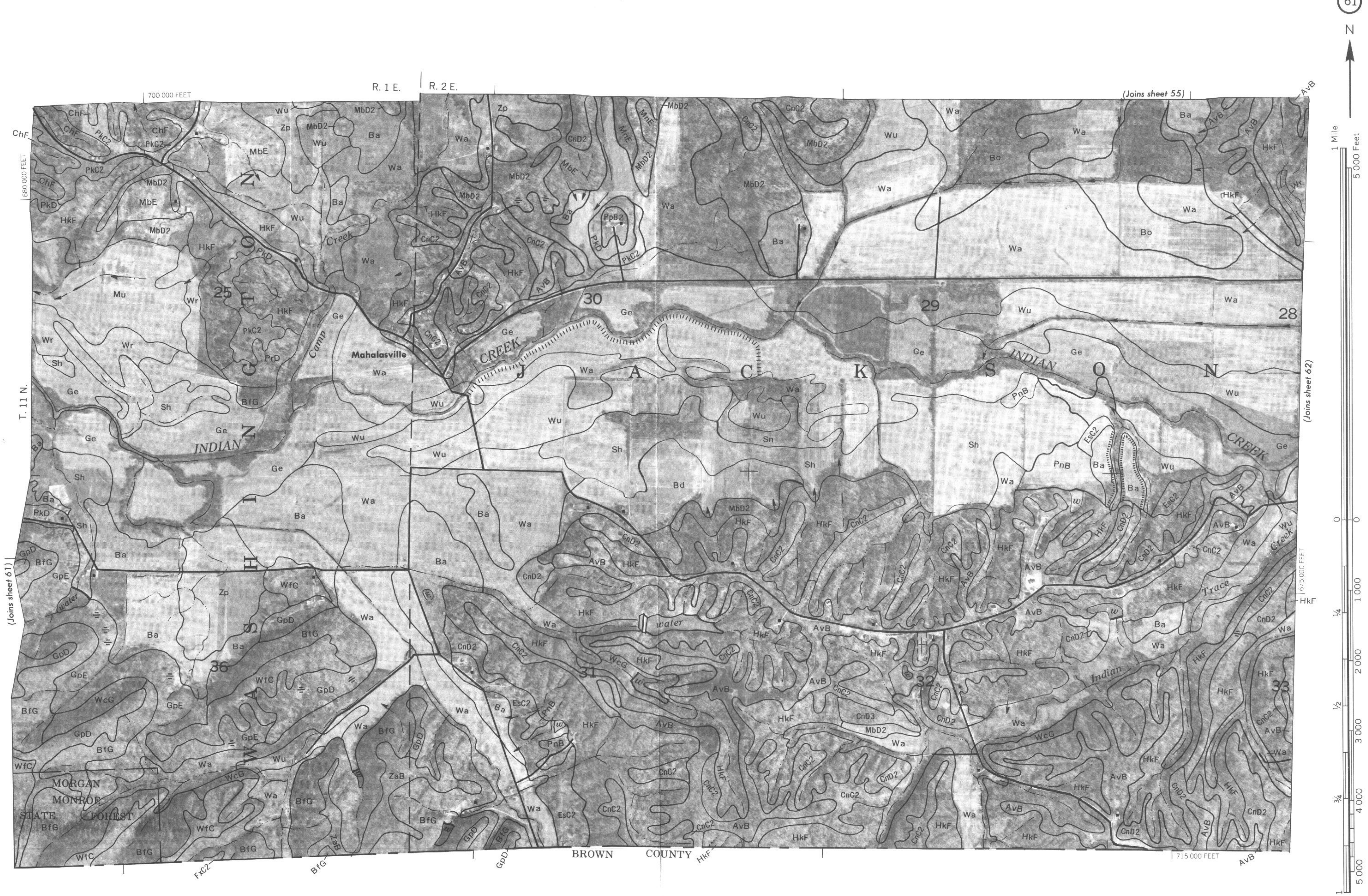
MORGAN COUNTY, INDIANA NO. 59

This map is compiled on 1974 aerial photography by the U.S. Department of Agriculture. Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.



This map is compiled on 1974 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

MORGAN COUNTY, INDIANA NO. 60



MORGAN COUNTY, INDIANA NO. 61
This map is compiled on 1974 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

62

N

1 Mile

5 000 Feet

0 ¼ ½ ¾ 1

0 1 000 2 000 3 000 4 000 5 000

(Joins sheet 56)

(Joins sheet 61)

R. 2 E.

T. 11 N.

675 000 FEET

720 000 FEET

735 000 FEET

530 000 FEET

MORGANTOWN

INDIAN CREEK

Crooked Creek

Long Run

Bear Creek

Pike Creek

Oliver Creek

MORGAN COUNTY

JOHNSON COUNTY

BROWN COUNTY

This map is compiled on 1972 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.